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Innovations in Urban Transportation in Europe and Their Transferability to the United States

February 1980

Service and Methods Demonstration Program

U.S. DEPARTMENT OF TRANSPORTATION
Urban Mass Transportation Administration and
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16. Abstract

Many of the innovations in urban transportation currently being attempted in the United States first appeared in European cities. The purpose of this report is to summarize and assess several of these European transportation innovations and to relate them to changes occurring or contemplated in the United States. Five areas of innovation are treated specifically: central city traffic rerouting and restraint, integrated transit, HOV priority treatment, coordination of transportation and land use, and residential neighborhood traffic restraint.

In-depth case studies of five European cities chosen for their innovativeness and diversity in urban transportation and land use concepts are presented. The cities -- Paris, Munich, Delft, Gothenburg and London - represent small, medium and large cities, each with unique ideas about providing mobility and a quality environment to their citizens.

In 1979 the Organization for Economic Cooperation and Development organized a Seminar on Urban Transport and the Environment. The results of the Seminar are summarized in several appendices.

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METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
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mi	miles	1.6	kilometers	km
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Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
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pt	pints	0.47	liters	l
qt	querts	0.95	liters	l
gal	gallons	3.8	liters	l
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yd^3	cubic yards	0.76	cubic meters	m^3
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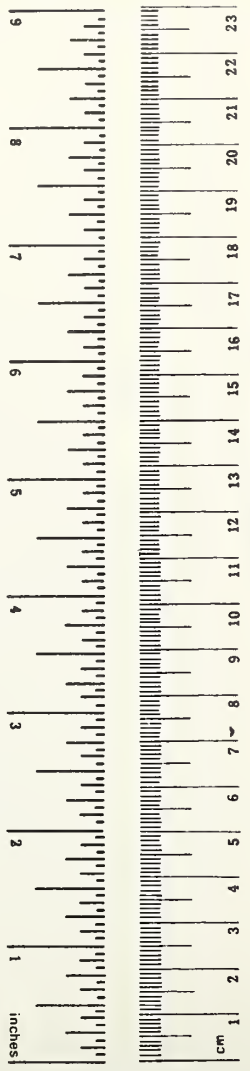
*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures. Price $2.25, SD Catalog No. C13.10:286.



Approximate Conversions from Metric Measures

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km	kilometers	0.6	miles	mi
		AREA		
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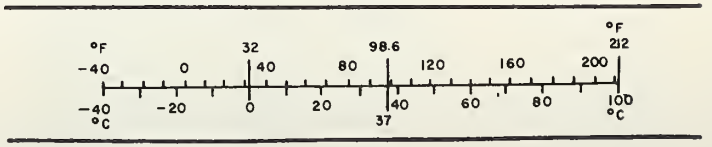

PREFACE

There is a great deal that the United States can learn (and has been learning) in the area of urban transportation from the countries of western Europe. This report examines many of the European innovations, relates them to changes occurring in the United States, and assesses their transferability to this country. Areas in which the Europeans are benefiting from the American experience -- such as paratransit and priority treatments on freeways -- are not addressed. The report is an outgrowth of work performed by the author in 1978 and 1979 while on assignment from the Transportation Systems Center to the National League of Cities and the Organization for Economic Cooperation and Development in Paris.

The author wishes to acknowledge several persons and organizations for their assistance in the preparation of this paper. These are Ronald Fisher and Joseph Goodman of the UMTA Office of Service and Methods Demonstrations, David Rubin, Howard Slavin and Carla Heaton of the Urban and Regional Research Division of the Transportation Systems Center, Bette Treadwell of the National League of Cities, and Ariel Alexandre of the Environment Directorate of the Organization for Economic Cooperation and Development. In addition, the author would like to thank the many officials in Paris, Munich, Delft, Gothenburg and London who very generously provided their time, information and insight. This study was sponsored by UMTA's Office of Service and Methods Demonstrations. Donna D'Alessandro and Terry McTague were invaluable in preparing the document.

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1. INTRODUCTION

1.1 Background

Many of the innovations in urban transportation currently being attempted in the United States first appeared in European cities where rapidly rising automobile populations, clogged streets, degraded urban environments and declining central cities caused governments and citizens to search for new solutions earlier than their American counterparts. The Europeans, having not let their cities and transit infrastructures reach a point of decay equivalent to that found in many cities in the United States, appear to be well on their way to reversing these conditions. While automobile ownership levels continue to grow, so does transit ridership. Vehicle fleets have been upgraded, new systems built and old ones renewed and extended. Regional transit services have been integrated into coordinated systems. Traffic-free precincts have been created in central cities as well as residential areas.

Transportation and land use trends in European cities have resembled those of the United States during the past thirty years. Urban populations have grown rapidly since the end of World War II. The population of Paris doubled and Munich's population tripled. There has been a rapidly rising level of automobile ownership. In Germany there is one car for every 2.5 persons while in the United States this figure is 2.0. The combination of inflation, shortages of resources and increased demands has led to fiscal austerity. This is evident in London where fares cover 73 percent of operating costs and where pricing and routing decisions for public transportation services are carefully related to demand elasticities in order to maximize passenger miles for a given level of expenditure.

The environment in the European central city has suffered considerably from the onslaught of the automobile, particularly in the historic sections characterized by narrow streets and dense development. Central areas have been losing population as citizens search for more land and cleaner air in the newer suburbs. As in America, many Europeans would prefer to live in a private home far from the city center, thus making the automobile a necessity.

Since these problems resemble those currently faced by American cities, the solutions being attempted by the Europeans are, likewise, applicable to the American situation. These solutions can be grouped into three areas: efficient and convenient public transit, restrictions on the automobile, and coordination of transportation and land use. The European finds it harder to use his automobile but at the same time public

transit has been made more attractive. This is all accomplished within a context of a rational and mutually supportive use of land and transportation infrastructure.

Public transportation has been made more efficient and convenient through the use of modern equipment. The Paris bus fleet is less than six years old. Networks are being expanded where appropriate. In London, the Underground (subway) has been extended to Heathrow airport and the new Jubilee line is being built through the city's center to relieve other overcrowded facilities and to provide rail service to the Docklands redevelopment area. Buses and LRVs are given priority wherever possible, both by signal preemption and through reserved rights-of-way. In Gothenburg, 80 percent of the LRV network is separated from general traffic.

Transit services are integrated to provide a coordinated system. Munich's MVV reorganized the schedules of the buses, trains, U-Bahn (subway) and S-Bahn (commuter rail) and implemented a unified fare structure based on concentric rings about the city's center. The MVV coordinates funding between the two major operators and performs all marketing functions.

Pricing is used both as a tool to encourage ridership and to generate revenues so that a better quality service can be provided. In London, the Underground is priced high to reflect the quality of rail service while the low bus fares reflect the less dependable service of the bus. Financing innovations help defray rising costs such as Paris' employer tax which generates approximately 22 percent of the total expenditure for public transit in the Paris region.

Transit is aggressively marketed. In Munich the MVV sells weekend cross-country ski packages which include a map of all the trails the MVV has laid out. Signs on Parisian buses request motorists to stay out of the reserved bus lane. Bus stops include clean shelters with route maps, schedules and, sometimes, a telephone.

As a complement to these increases in transit level of service, various restrictions have been placed on the automobile. There are hundreds of pedestrian zones in European central business districts (CBDs). Many central areas are divided into traffic cells that can only be crossed by transit vehicles. The center of Gothenburg was divided into five cells in 1970, and in 1979 two new cells were added. The automobile is being restricted in residential areas through residential parking permit programs and traffic flow restrictions . The Dutch "woonerf" and the German "wohnbereich" have been used to turn residential streets into pleasant spaces for human activities.

Congestion pricing, where the auto driver pays for the congestion and negative environmental effects he causes, has been successfully implemented in Singapore and is under consideration by the Greater London Council for central London.

Transportation and land use planning are completely integrated in Europe. For example, the broad-based French national plan is translated into specific actions by the Regional Planning Authority for Paris. Their master plan for the ten million inhabitants in the 4,610 square mile area carefully combines land use, transportation and environmental considerations. Joint development projects such as London's Hammersmith help pay for public transit improvements while reinforcing the effectiveness of the transportation system.

In summary, there are a number of themes that characterize the current European attitude and experience: provide a convenient and reliable public transit system; favor public transportation over the automobile and restrain the use of the automobile in central cities; create a regionwide balance among modes; provide a better environment for pedestrian and urban residents; make the best use of what already exists; integrate transportation and land use; and orient all programs towards serving the people and facilitating a strong city.

1.2 Purpose and Organization of Report

The purpose of this report is to summarize and assess many of these European transportation innovations and to relate them to changes occurring or contemplated in the United States. Five areas of innovation will be treated specifically: central city traffic rerouting and restraint, integrated transit, HOV priority treatment, coordination of transportation and land use, and residential neighborhood traffic restraint. These topics are discussed in Sections 2 through 6.

Sections 7 through 11 include in-depth case studies of five European cities chosen for their innovativeness and diversity in urban transportation and land use concepts. The cities--Paris, Munich, Delft, Gothenburg and London--represent small, medium and large cities, each with unique ideas about providing mobility and a quality environment to their citizens.

The report attempts to provide an understanding of the conditions necessary for the successful implementation of these concepts. However, the scope of the effort did not permit the collection of a data base adequate for statistically valid analyses. Rather the reader is asked to weigh both the wide-spread implementation of these concepts in many different

European environments and the initial successes in the United States as convincing evidence of their transferability to American soil. Throughout the report nonessential figures are not referenced but are included to illustrate and clarify the text.

1.3 Diffusion of Innovation to the United States

It is evident from just a casual reading of this report that the Europeans are far ahead of the United States in many areas of transit innovation. (Areas in which the United States is in the lead, such as paratransit, brokerage and ramp metering and reserved lanes on freeways, are not considered.) However, a considerable amount of experimenting with these concepts has been occurring in the United States, particularly over the past several years as a result of the efforts of the U.S. Department of Transportation's (DOT's) Urban Mass Transportation Administration's (UMTA's) Service and Methods Demonstration (SMD) Program. The SMD Program was established in 1974 to provide a consistent and comprehensive framework within which innovative transportation management techniques and transit services could be developed, demonstrated and evaluated, and the resultant findings disseminated in a timely manner to transportation planners, policymakers and transit operators. The program focuses on strategies that involve the imaginative use of traffic management, pricing and marketing techniques, transit service variations, and existing technology to produce improvements which require relatively low levels of capital investment and which can be implemented in a short time frame.

Since the inception of the SMD program, over 50 demonstration project grants have been awarded and have been or are being evaluated. In addition, 14 special evaluations of non-SMD funded projects have been completed. The program has also conducted over 25 analytical and planning studies of new concepts, cross-cutting studies of concepts implemented at more than one demonstration site, and special research aimed at improving the state-of-the-art in evaluation methodology. Many of the projects and evaluation results are summarized in this report.

The thinking within the SMD program as well as other areas of DOT has been greatly influenced by the activities of the Environment Directorate of the Organization for Economic Cooperation and Development (OECD) in Paris. Several persons from DOT have participated actively in the OECD's Group of Experts on Traffic Policies for the Improvement of the Urban Environment. The OECD activities are summarized in Appendix I.

In 1979 the OECD, in cooperation with the European Conference of Ministers of Transport, organized a Seminar on Urban Transport and the Environment. The Seminar resulted in the publication of several documents. Appendix II summarizes the background reports for the specialized sessions and contains the conclusions reached by the general rapporteur for these sessions. The summary of the city case studies is found in Appendix III. Appendix IV contains the conclusions prepared by the Seminar's chairman.

The members of the American delegation to the Seminar included representatives from federal, state and local governments, transit operators, regional planning agencies and related organizations (see Appendix V). Following the seminar, the delegation visited the five cities reported on in Sections 7 through 11.

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2. CENTRAL CITY TRAFFIC REROUTING AND RESTRAINT

2.1 Introduction

European cities were designed and built long before the advent and proliferation of the automobile. With their narrow congested streets, high density developments and well established public transit systems it is no wonder that they have led the way in traffic restraint. There are currently relatively few European towns and cities that do not have some form of minimal traffic restriction, be it only the closing of the main shopping street or square on market days. Many cities have extensive pedestrian areas that divide the center into traffic cells. Parking management has been playing an increasingly important role in central area traffic restraint, and a road pricing scheme is being contemplated for central London.

In the United States, traffic on central city streets has been rerouted through the use of transit malls and auto restricted zones. Parking management is currently being used in an attempt to reduce the number of auto trips made to the CBD during peak periods and to other sensitive areas. Road pricing has been proposed but its political sensitivities have left it without a locale willing to attempt it.

2.2 Pedestrianization

Europe

A survey conducted by OECD and Europa Nostra (Council of Europe) found that over 95 percent of the European cities surveyed had at least one pedestrian zone. In Western Europe about one third of these zones were implemented before 1970. Pedestrianization has typically taken place in areas already alive with street activity, such as principal shopping streets, and activity has tended to increase. The zones are usually centers of entertainment and shopping. But pedestrianization of a street not offering a particular attraction or not lying on a natural foot route has not always been a success.

The visual appearance of the pedestrian zone is felt to be important. New paving, tree plantings, flower gardens, sculpture and special lighting play a major role in the quality of these areas. Care is taken to create an atmosphere of human scale by providing just enough visual points and activities to fill the space vacated by the automobile. Street furniture plays such a role as do the vendors who are permitted to sell newspapers, flowers and refreshments. Many pedestrian areas are the focus of architectural competitions to obtain the best visual appearance

(Munich, Section 8.5.1). Experiments at pedestrianization may include temporary planters with trees and flowers, benches and fountains, in an attempt to create a true representation of the permanent project (Passy in Paris, Section 7.6).

The size of the zones vary from just a block or a principal square to large areas of the central city. Munich's central pedestrian zone covers an area of approximately .36 square mile and is being expanded (Section 8.5). Refering to it as an outdoor architectural museum of four centuries, the Mayor of Paris would like to create an urban pedestrian promenade 1.6 miles in length, stretching through the center of the city and connecting several existing pedestrian areas (Section 7.6). There are attempts in other cities to create such city-wide pedestrian networks. The Greater London Council is working on a plan to link the more than 200 pedestrian streets and ways into a unified system (Section 11.4.7).

In most cases the creation of the pedestrian zones was a feature of a comprehensive plan coordinating transportation and land use requirements. Munich's large pedestrian area would not have been possible without the new subway built beneath it and a boardering road that diverts through traffic (Sections 8.4 and 8.5.4).

Surface public transportation is carefully integrated into these projects and is afforded priority over the automobile, often through the creation of a transit mall. A transit mall is a street on which transit vehicles are given exclusive or near-exclusive use, sidewalks are widened, and amenities are added for pedestrians and waiting transit patrons. Access for automobiles is denied or strictly limited, except for cross-street traffic. A transit mall represents a compromise between preferential treatment for transit vehicles (e.g., priority signalization) and a full pedestrian mall.

Trams run down a narrow pedestrianized street in Amsterdam and buses and taxis fill the narrowed roadway of London's Oxford Street, the city's major shopping street (Section 11.4.6). In Monchengladbach, West Germany experimental battery operated buses are used on a 4500 foot length of the pedestrianized Hindenburgstrasse shopping street. There is only a slight curb separating the 25 foot pedestrian walkways from the 22 foot busway. The entire area has been resurfaced in attractive brick and pedestrian amenities such as bus shelters, benches and transit information provided.

Downtown surface parking lots are often prohibited and new parking structues are built at the edges of pedestrian areas convenient to road access. Oftentimes the ground floors of these

Transit Mall in Amsterdam

Transit Mall in Munich

London's Oxford Street Transit (Bus and Taxi) Mall

Philadelphia's Chestnut Street Transit Mall

structures are used for commercial purposes which greatly reduces their visual impact on the urban fabric.

Larger pedestrian areas are used to divide the city center into traffic cells. Pedestrianized streets serve as boundaries over which private vehicles are not allowed to pass. Buses, trams and bicycles are often excluded from this ban. Rather, they are afforded preferential treatment from one zone to another and for travel through the center of the city. The center of Groningen, the Netherlands was divided into four cells in 1976. The 1970 five cell scheme in Gothenburg has been expanded to seven cells and additional cells are planned (Sections 10.4 and 10.5).

These larger cell systems require a detailed traffic circulation plan so that sufficient access by the automobile is maintained and so that traffic not having a destination within the cell system can bypass the area without undue delay. Unless the level of automobile usage is severely reduced, this necessitates the creation of a ring road around the cell system.

This repository for diverted traffic plays a controlling role in the feasibility of all pedestrian schemes, and the environmental improvements to the pedestrianized areas must be carefully weighed against disbenefits elsewhere. If the diversion route is a wide street with few pedestrian oriented functions and only limited needs for crossing, as in Gothenburg, then the diverted traffic will cause few problems. The increased volumes along the ring road actually travel at a higher speed and emit fewer pollutants since lights are timed and there is less cross traffic. The two large pedestrian areas in Paris' Latin Quarter and Beaubourg districts are surrounded by broad boulevards that easily accommodate the increase in traffic, but the smaller rue de Passy pedestrianization experiment was a failure due to the absence of an adequate diversion route (Section 7.6).

Sometimes an existing road has been widened or a new road built as was a portion of Munich's ring road. Here buildings were demolished, leading to considerable damage to the social structure through which the road passed. As a result, the remaining portion of the ring road will not be built. Interestingly enough, the effectiveness of the expanded public transit system combined with the existing street network indicates that the ring road is no longer an essential element of the plan (Section 8.5.4).

The results of the pedestrianization schemes in Europe have been decidedly favorable. Environmental improvement was found to be closely related to the removal of traffic. There have been

nearly universal reductions in noise levels and air pollution on the pedestrianized streets with negative effects occuring on the diversion routes. Pedestrian counts increased in 73 percent of the sites surveyed by the OECD. Rents and land prices have increased or remained stable. Business volumes increased in 50 percent of the cases, remained stable in 22 percent of the cases, and decreased in the rest. Only 18 percent of the sites noted a trend to shops selling lower priced merchandise while nearly all cities replied that the pedestrian zone had a positive effect on the city's image. The streets, once freed of the automobile, have taken on new purposes such as art exhibits, folklore parades, markets, theater, festivals, political meetings and concerts. Eighty percent of the zones are expected to be increased in size.

United States

Pedestrianization in American cities has proceeded more slowly than in Europe. After World War II American automobile ownership grew much faster than in Europe. However, rather than resulting in an intolerable level of congestion on city streets as in the historic European centers, the wider American streets were able to accommodate the increased traffic flows. In addition, the migration to the suburbs began earlier in the United States than in Europe, relieving pressure on the older street network.

Arterials and freeways were built to accommodate the travel needs of the new suburban residents, often at the expense of existing inner city neighborhoods. As people moved farther from the central city they became more dependent upon the automobile. Transit services were allowed to decline, accelerating this dependence. The once vibrant, mixed-use activity centers became monotone in their function, with large areas devoid of activity after working hours. Buildings were allowed to decay and were replaced by surface parking lots or isolated office towers that added to the decline of the urban fabric. The downtown had lost its human scale and was no longer perceived as an area in which to stroll, relax, shop, and enjoy cultural experiences.

The result is that the numerous opportunities for pedestrianization that are found in Europe do not currently exist in many American cities. Pedestrianization of an area lacking a sufficient level of activitiy, a pleasant urban fabric and public transit that provides a viable alternative to the automobile has little chance of achieving success. This has been illustrated by the shopping street pedestrianizations of the 1950s and 1960s, such as Miami Beach's Lincoln Road Mall, which were an attempt to create a "suburban" shopping mall environment in the cities' declining downtown shopping districts to compete with the new

regional malls. These schemes typically did not address the need for transit access. Rather, large parking garages were constructed behind the malls in an attempt to lure shoppers coming by automobile. No effort was made to discourage auto use, to encourage transit, or to create an urban fabric oriented to the pedestrian other than on the single pedestrianized street. Many of these malls were unsuccessful because former shoppers had moved to other areas of the city and the streets were sadly devoid of activity once the cars were gone.

Fortunately, current trends indicate a movement of population and activity back to some central cities, a greater concern for the preservation and enhancement of the urban fabric, and an increased importance on public transit. One of the earliest American projects to integrate transit into a pedestrianization scheme is Minneapolis' highly successful Nicollet Transit Mall. Today transit malls exist in several U.S. cities. Characteristics of those in Minneapolis, Philadelphia, Portland and Madison are presented in Table 2.1. Figure 2.1 contains block designs for Minneapolis and Philadelphia.

Studies* have found that expected economic benefits are usually the main reason for building a mall in the United States, and that implementation often depends on the involvement and cooperation of local businessmen. Rerouting of bus lines onto the malls, new shelters, and information displays are common transit service changes. Total costs range from $3.8 to $16.9 million; costs per square foot range from $15 to $37.50. The extent of amenites and number of blocks involved help explain these cost variations. The choices of a one or two street mall, one or two directional flows, roadway curvature, midblock pedestrian crossings, and signal timing at cross streets affect the capacity for buses and bus speed. These factors can be used to enforce a bias toward pedestrian or transit use.

Funding has been the primary bottleneck to implementation. Major sources are UMTA capital grants, transit authority or city funds, and property assessments. The last is the most difficult to arrange due to resistance to incurring costs and problems of "equitable" assessment among property owners. Additional bottlenecks include fear of congestion on streets receiving diverted autos; maintaining access (or paying compensation) to parking establishments; arranging goods delivery by means of off-hour, cross-street or rear-alley loading; and fear of interrupting businesses during construction.

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*This section on transit malls and auto restricted zones is taken directly from Heaton and Goodman, 1980.

TABLE 2.1

CHARACTERISTICS OF FOUR TRANSIT MALLS

SITE	PROJECT STATUS	PROJECT COST	FUNDING SOURCES	PRIMARY PROJECT BACKERS	AREA LAND USE	EXPECTED BENEFITS	TRANSIT TYPE
MINNEAPOLIS Nicollet Mall	Completed 1967	$3,800,000 $1,170 per ft. $15 per sq. ft.	74% Assessment district 13% UMTA demonstration grant 13% Urban Beautification grant	Downtown business	Retail core Offices	Retail improvement. Improve bus service/ operations.	Standard transit buses. Shuttle minibuses. Re-routing onto mall.
PHILADELPHIA - Chestnut Street Transitway	Completed 1976	$7,000,000 $1,300 per ft. $22 per sq. ft.	80% UMTA capital grant 16.7% State DOT 3.3% City capital funds	City govt./ planners Downtown business	Retail core Offices	Improve retail environment. Transit for Bicentennial crowds. Upgrade transit	Standard transit buses. Tourist buses. Minor re-routing
PORTLAND - Fifth & Sixth Streets Malls	Under construction; expected completion by mid-1978	$15,000,000 $2,700 per ft. $33 per sq. ft. Plus $1– 1.5 million added utility costs	80% UMTA capital grant 20% Tri-Met Plus utility costs by city depts./utility companies	City govt./ planners Downtown business	Office core Intersects retail core	Increase transit use & operational efficiency Retail/pedestrian environment Reduce suburban sprawl.	Standard transit buses Re-routing onto mall
MADISON – State Street Mall/ Capitol Concourse	Pedestrian mall complete 1975. Capitol Concourse construction scheduled 1977-78. State St. in design phase, completion 1979.	$7,800,000 $1,150 per ft. $16 per sq. ft.	Mix of City, University, UMTA Sec. 3, & assessment district (varies by phase – see text)	City govt./ planners	Retail Government	Improve pedestrian environment Upgrade retail area Upgrade transit	Standard transit buses Shuttle buses

TABLE 2.1 (cont'd)

CHARACTERISTICS OF FOUR TRANSIT MALLS

SITE	NON-TRANSIT USES	BUS VOLUME	PEDESTRIAN VOLUME	TRAFFIC SIGNAL TREATMENT	MOVEMENT OF GOODS	AMENITIES
MINNEAPOLIS – Nicollet Mall	Taxis Emergency vehicles Bicycles	Peak hr.: Before: 20/ea. way After: 60/ea. way	Before 1,068/block side/hr., 12-hour period After: 1,114/block side/hr., 12-hour period	Re-set for cross traffic flow (computerized traffic control system scheduled).	Alley loading; mall loading by special permit.	Extensive, including electric snow-melting mats, sign ordinance, bus shelters
PHILADELPHIA – Chestnut Street Transitway	Taxis at night, one block only day Emergency vehicles General traffic (1 block only)	Peak hr.: Before: 43 (one way) After: 41/eastbound 11/westbound	After: 3,016/block side/hr., peak periods on major blocks	Bus-triggered mid-block warning light. Signal timings set for expected bus speed. Timings on nearby street reset.	Cross st. loading; on mall by special permit in off-hours	Typical, with mid-block crossing area.
PORTLAND – Fifth & Sixth Streets Mall	General traffic on one lane for 3/4ths of blocks	Peak hr.: Before: 32 6th Ave. 85 5th Ave. Expected After: 207 6th Ave. 211 5th Ave.	Before: 444 6th Ave./ 686 5th Ave./ block side/hr., off-peak periods.	Computer controlled with progression to be adjusted for buses.	Cross st. loading; on mall by special permit in off-hours	Extensive, including bus shelters and concession booths, CRT information display.
MADISON – State Street Mall/ Capitol Concourse	General traffic on Capitol Concourse	Peak hr.: Before: 60 (2-way on State St., 1-way on Capitol Square)		On Capitol Square set to make leaving concourse difficult.	Loading on alleys, cross streets, some curbside during restricted hours.	Typical

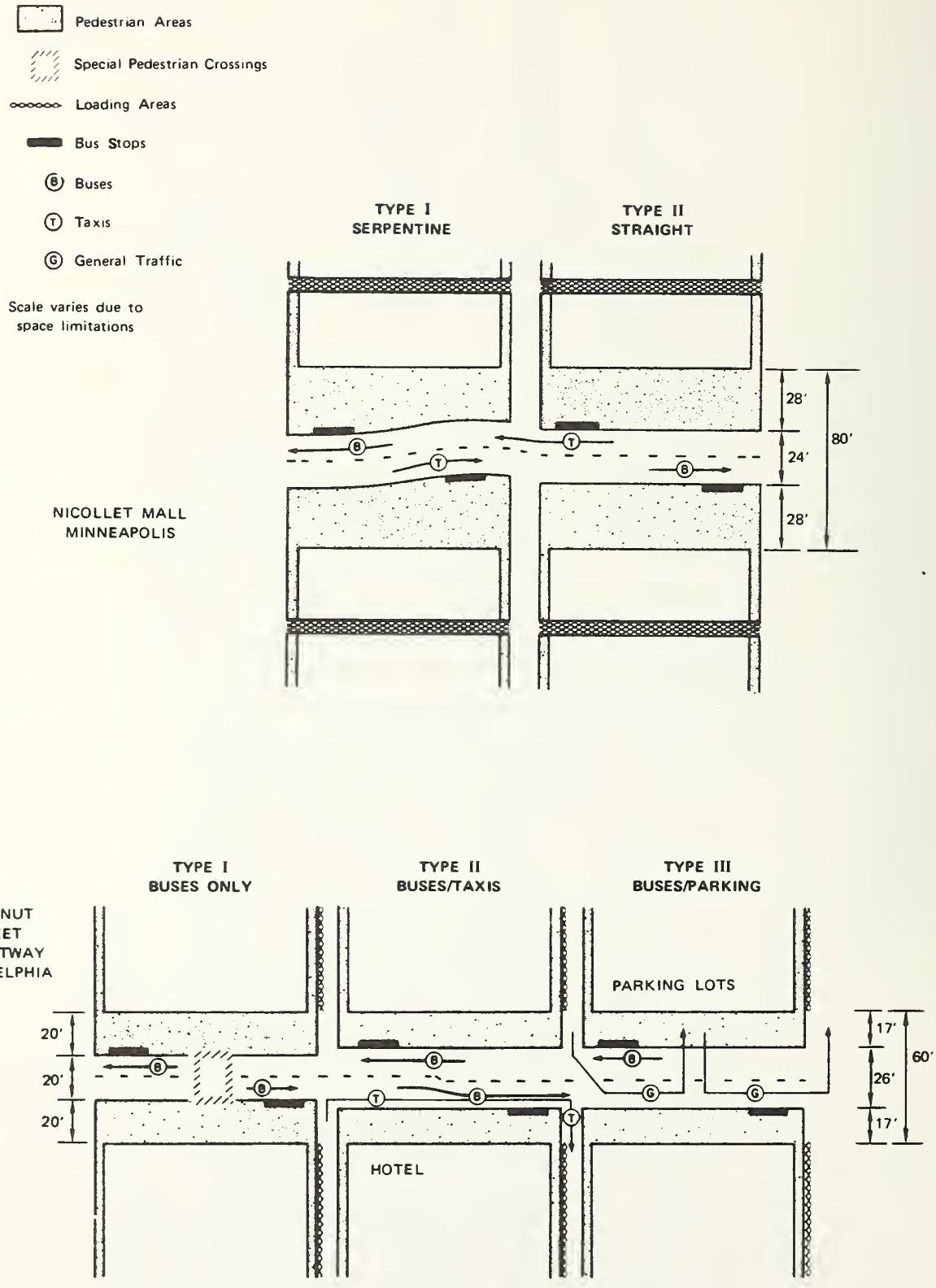

Figure 2.1 TRANSIT MALL BLOCK DESIGNS

Transit malls are relatively inexpensive improvements compared to other capital expenditures for development or redevelopment. Transit travel times have remained approximately the same due to frequent stops and increased patronage except in Portland where there have been trip time reductions of about 50 percent due to improvements in signal progression. Traffic diversion has not caused congestion on alternate streets. There have been relatively few violations of bus-only blocks by autos. Goods delivery has been least interrupted where rear alleys are utilized. Malls create an attractive and convenient environment for pedestrians and transit users. There was no apparent overall reduction in pedestrian injuries and fatalities, although non-pedestrian accidents have decreased sharply. Carbon monoxide levels have been lower on the malls but where large bus volumes are found noise and nitrogen dioxide are believed to have increased. Mall construction reduced pedestrian and business activity, but the impact was less than expected by merchants. Declining retail sales may have been curtailed and secondary economic indicators are positive.

Similar to the more elaborate European cell systems are the four auto restricted zone (ARZ) projects being sponsored by the SMD Program. An ARZ is an area created in a congested portion of the city, such as the central business or shopping district, where automobile traffic is prohibited or restricted. The focal point of the ARZ is a pedestrian and transit enhancement zone. To this core, a host of elements can be added: linear transit malls that extend or connect the core to other pedestrian activity centers, reserved bus lanes, transit and taxi facilities, peripheral parking garages, special loading docks, internal or feeder shuttle service, ring roads for the rerouting of through traffic, underground rapid or light rail facilities, congestion pricing for entry into the ARZ, and priority treatment for HOV's on highways providing access to the area. An ARZ generally requires a comprehensive redesign of the CBD street system to provide improved access into and within the area for pedestrians and transit travelers while not degrading internal circulation by delivery, service and emergency vehicles or worsening peripheral circulation by all classes of vehicles.

The SMD Program has generally operated on the assumption that a carrot and stick approach may be the only politically feasible means of implementing auto restrictive measures. Thus, projects entailing physical, operational, or pricing restrictions on auto use also include a complementary package of incentives or improvements. The four ARZ projects illustrate this principle in that they all include a number of visible improvements -- for example, improved transit service and pedestrian amenities -- which are intended to maintain access into and within the area, minimize adverse impacts on peripheral areas, and provide a more

pleasant environment for people within the area. As can be seen from Table 2.2 and Figure 2.2, the four demonstrations offer considerable variation in terms of area characteristics, project elements, and geographic and financial scope.

The Memphis ARZ is the simplest of the plans, involving enhancement and extension of the existing mile-long Mid-America Mall. The project will add a second dimension to the pedestrian treatment, as well as provide a strong connecting transit link with a major employer --the Medical Center. Also included is the development of a downtown transit terminal, sidewalk improvements, bus and pedestrian shelters, and shuttle service between the CBD and the Medical Center.

The Boston ARZ is intended to link the Washington Street shopping area to other major pedestrian activity centers -- the Boston Common, the Waterfront, and Government Center. The project includes elimination of auto traffic from an 11-block area in the core retail area, full pedestrianization of four major streets, the rerouting of express and local bus routes to provide access directly into the ARZ, and a variety of complementary elements such as street improvements, signing, relocation of taxi stands, and new loading areas.

Broadway Plaza in New York City is planned to be a linear auto free area from 45th to 48th Streets in the heart of the Theater District, and a transit mall from 48th to 49th Streets. Since vehicular traffic will continue to use existing cross-town streets, the project area is actually comprised of three plazas. Creation of the auto-restricted area will involve rerouting southbound traffic on Broadway to parallel facilities and widening Seventh Avenue to handle some of the diverted traffic. Other planned elements of the project include a motorist guidance system, elimination of metered on-street parking spaces on Broadway north of 47th Street, expanded bus and taxi loading areas, and construction of a complete transit, theater, and tourist information center. This area is filled with street activity and is well accessed by bus and rapid rail transit. Present economic conditions in the Times Square area are varied. While the Broadway theater district has had a major revival in the last few years, Times Square proper remains tawdry. It is hoped that Broadway Plaza will contribute to the area's economic revitalization and provide a pleasant environment for workers, shoppers, tourists, and theater-goers.

The ARZ project in Providence covers only a small portion of the CBD area, but will provide an important pedestrian and transit link between the major CBD activity centers: the retail district which already has a pedestrian mall, the financial district, and the refurbished Union Station. Limited right-of-

TABLE 2.2

CHARACTERISTICS OF THE FOUR AUTO RESTRICTED ZONE DEMONSTRATION PROJECTS

	New York (Manhattan)	Memphis	Providence	Boston
Funding Sources	37% UMTA (sec. 3) 6% UMTA (sec. 6) 20% Urban Systems 37% State & Local	77% UMTA (sec. 3) 8% State 15% Local	67% UMTA (sec. 3) 16% UMTA (sec. 6) 17% Local	25% UMTA (sec. 3) 47% UMTA (sec. 6) 28% Urban Systems
Primary Objectives	To promote economic development of area & create focal point to promote indentity of Times Square.	To connect independent elements of downtown & to coordinate their operation for short-range downtown improvement.	To connect downtown districts, enhance pedestrian environment, improve transit service, disperse traffic, provide adequate facilities for good delivery.	To increase retail sales, bus ridership & pedestrian volumes.
Vehicle Restrictions/ Road System Changes	Broadway between 45th & 48th closed to all traffic; between 48th & 49 a 1-block transitway; between 49th & 50th, priority treatment for buses.	No major changes.	Auto traffic eliminated from Dorrance & Francis (transit malls), Kennedy Plaza/Union Station area & 1-block extension of Westminster Mall.	Auto traffic eliminated from all of Winter, Hawley, Temple Place & portions of 4 other streets Circulation Circulation pattern simplified.
Transit Modifications	Revised bus rtes. due to detour caused by Broadway Plaza; special taxi & transit loading areas; transit information center.	Shuttle bus service to Medical Center area; new downtown busterminal; 2 Medical Center bus shuttles.	Through bus routing & free fare zone downtown, new transit terminal berths, busway & terminals.	Bus routes changes; exclusive transitways & contraflow bus lanes; 5 new taxi stands.
Goods Movement Changes	Deliveries before 11 a.m.	No major changes.	Re-routing, creation of loading areas, & loading restrictions.	Deliveries before 11 am except for certain time dependent deliveries permitted after 2 p.m.
Parking Changes	On-street parking eliminated.	Elimination of 89 on-street spaces.	Elimination of 242 spaces.	Elimination of 600 spaces.
Changes in Pedestrian System	Pedestrian plazas & sidewalk improvements.	Sidewalk improvements.	Exclusive pedestrian areas; sidewalk improvements.	Full pedestrianization of some sts. Increased space on others.
Expected Impacts	1-5 min. increases in bus travel time; thru-auto traffic adversely affected; delays on cross sts; improved pedestrian environment & meeting place; economic development.	500 passengers/day on shuttle bus; economic development; improved physical & functional quality of pedestrian environment; thru-auto trips affected adversely.	CBD transit trips up 10% auto trips down 3.2%; improved transit travel times; improved environment; thru-auto traffic adversely affected; beneficial historic impact.	Increased regional transit ridership (2.2%); goods movement costs (6.5%; retail sames & congestion; improved accessibility to CBD; Improved air & noise environs; reduced pedestrian conflicts.

TABLE 2.2 (continued)

CHARACTERISTICS OF THE FOUR AUTO RESTRICTED ZONE DEMONSTRATION PROJECTS

Characteristics	New York (Manhattan)	Memphis	Providence	Boston
Project Area	Broadway, between 45th & 59th Sts. (includes Times Square).	Existing special taxing district in the Memphis CBD & Medical Center area, 1.25 miles outside CBD.	Various parts of Providence CBD.	Core retail & financial districts of Boston CBD.
Area Land Use	Theater District, offices, service & light retail uses.	Office, banking & retailing uses.	Financial district, retail center, Kennedy Plaza, & Union Station.	Retail (principally) & office uses.
Transit Availability	Times Square is a major subway terminal; it is served by 3 bus rtes, operating 60-76 buses/hour; it is also focus for special bus operations ("Culture Bus")	CBD served by 51 transit rtes, which serve areas to north, south, & east. 23 are peak hour routes.	Within statewide transit system, 32 rtes serve CBD & carry 30,000 passengers/day.	CBD is hub of regional transit network that offers a broad array of services (rapid transit, local bus, express bus, shuttle bus, rail & taxi).
Pedestrian Activity	Most north-south blocks in project area carry several thousand pedestrians at midday & evening peaks.	Mid-America Mall is a major pedestrian area, linking 2 important areas, Court Square & Civic Center Plaza.	Pedestrian activity peaks during lunch time; a 2nd high period is between 4 & 6 p.m. Westminster Mall & section of Weybosset St. adjacent to Mall carry high volumes.	At peak, pedestrian volumes on Washington, Tremont, Summer & Franklin are in 5,000-9,000/hour range; facilities to accommodate these volumes lacking.
Economic Activity	Area considered "weak" although census figures show Manhattan CBD, including Times Sq., faring better than most CBD's as retail center.	CBD retail position weakening in face of competition from suburban retail outlets.	After construction of Westminster Mall, retail sales in CBD increased by 1.5%, compared to a 20% decline in rest of city.	Since 1972, a 14% constant dollar decline in retail sales; however, vacant retail floor space is minimal & major retail establishments are showing commitment to CBD.
Project Status Project Cost	Construction beginning spring 1980. $6,250,000.	Construction Began fall 1978. $1,241,820.	Construction Beginning spring 1980. $5,866,000.	Opened summer 1978. $3,217,955.

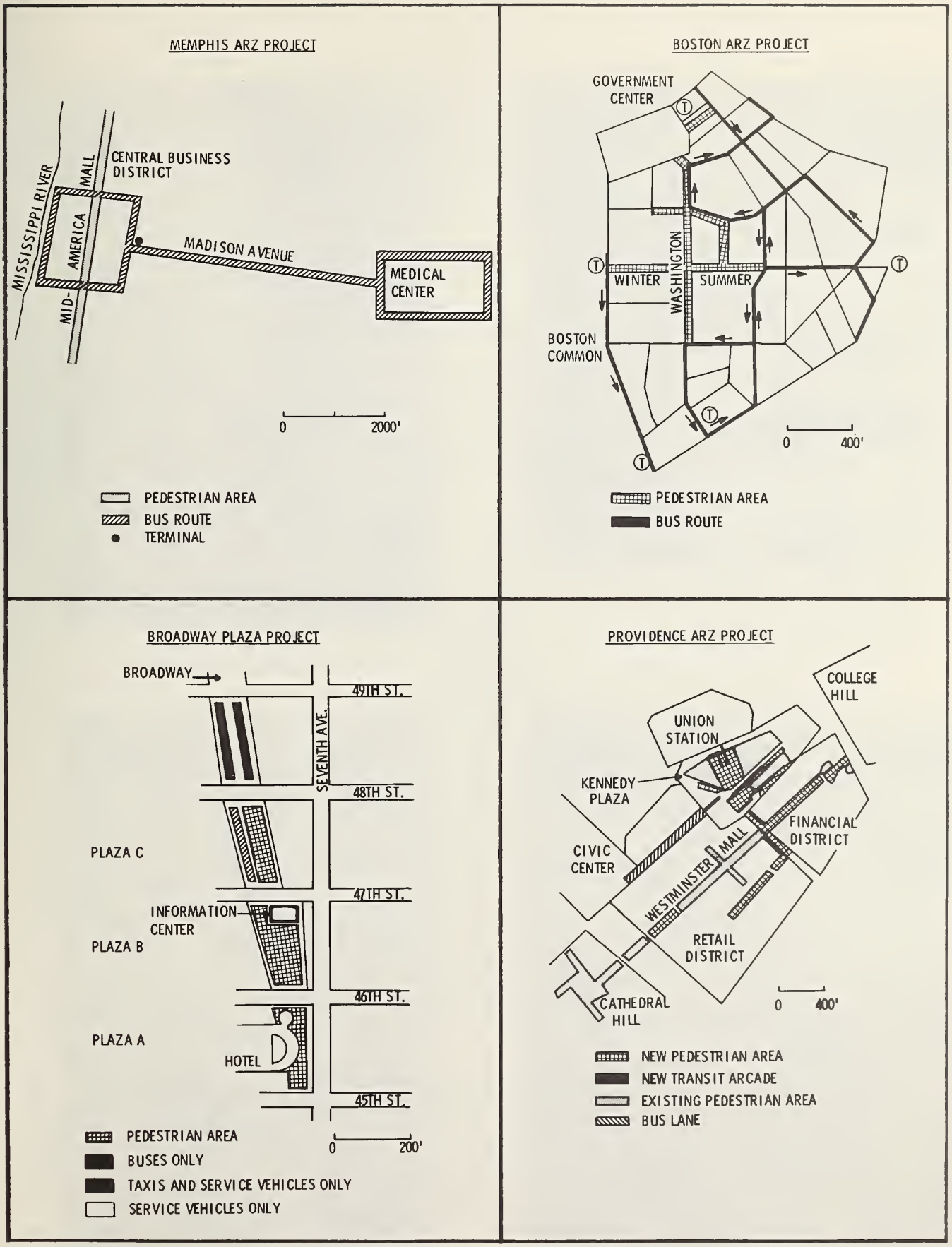

FIGURE 2.2 AMERICAN AUTO RESTRICTED ZONE PROJECTS

Boston's "Downtown Crossing" ARZ

Boston ARZ

Petitioners in Favor of Paris' Passy Pedestrianization Experiment

way space is to be reallocated to pedestrians and transit, while major through circulation for automobiles will be moved to the periphery. The plan calls for a main transit terminal, two busways, improvements to an existing exclusive bus lane, and a pedestrian plaza in front of City Hall. Through routing of transit vehicles and a fare-free zone are also planned.

Perhaps the most important finding, supported by experience from all of the U.S. projects (and the European ones, as well) is the need to involve potentially affected groups -- various governmental organizations, transportation providers, business establishments, and the public -- in the planning and design process as early as possible. This is especially important in the case of merchants who are concerned about the impacts of the project on retail sales and goods delivery during construction and afterwards. It is interesting to note that this was not done in the case of Paris' unsuccessful Passy pedestrianization experiment.

Another observation is the need for a strong lead agency with both the funds and the leverage to coordinate and expedite the planning/implementation process in an effective manner. Even with the appropriate organizational structure and communications channels in place, however, the expected lead time from inception of the idea to project commencement is not insubstantial, and is likely to be several years. This is particularly true where funding for the project is being assembled from various sources --public and private -- each of which may have different administrative requirements and procedures.

In these projects as in other types of projects involving major changes in automobile and/or transit services, it has been critical to launch an effective public information program well in advance of project implementation. In addition, there must be a comprehensive and comprehensible signing system to indicate how vehicles should proceed around or into the area and when various restrictions are in effect. There should be an adequate force of personnel available in the first few weeks of operation to assist and sooth the frustrated and/or modify the restrictions. Moreover, the Boston ARZ experience suggests that an effective enforcement program, while costly, may be important to the smooth functioning of the project and its credibility to the public.

There is considerable evidence from the transit mall and ARZ projects to suggest that restricting vehicle movement and parking on congested CBD streets does not lead to increased congestion on peripheral streets. Among the explanations for this are the following: (1) vehicle throughput on the streets slated for closing is generally low; (2) much of the traffic on these

streets is actually motorists searching for parking spaces (who afterwards go directly into off-street facilities); and (3) the removal of on-street parking, greater enforcement of illegally parked/ stopped vehicles, and the improved signing and signalization have the combined effect of increasing the capacity of peripheral streets.

2.3 Parking Management

Parking management is defined as a program of actions taken to alter the supply or operation of a jurisdiction's parking system to promote local transportation, economic, environmental, and other applicable objectives. Parking management may include the metering or withdrawal of on-street spaces, controls on the pricing of off-street facilities, and controls on the amount and location of parking in the area.

Europe

While street closings and traffic cells have resulted in a rerouting of unwanted traffic from the crowded central streets to the periphery, parking management is seen to play a more important role in the actual reduction of vehicle miles travelled (VMT). Parking management schemes have not found universal application in European cities (for example, underground parking garages are still being built throughout Paris). Nor do they always result in traffic restraint. The heavily congested Inner London Parking Area had as its goals an improvement in bus operations, the environment and pedestrian conditions, a reduction in fuel consumption and an increase in vehicle speed. While able to control on-street spaces, general-use parking garages and the provision of new parking facilities for private use, the Greater London Council had no powers to control the use made of existing parking facilities for private purposes. As a result the total number of vehicles parked in non-residential spaces has not changed. People have merely shifted to off-street facilities (Section 11.3.1).

Munich's parking management has been more successful. In the central one square mile that includes the pedestrian zone no new parking spaces have been permitted since 1971 and the number of spaces has been decreased from 17,000 to 12,000. Building codes require a certain number of spaces per building, but developers of new buildings in the CBD are permitted to construct only ten percent of this required number. They pay to the city $3,750 for each space not constructed, and the city then uses this money to construct parking spaces in other areas where parking is needed such as at rail stations (Section 8.5.5).

Gothenburg has recently implemented a parking program to restrain the use of the automobile and achieve a better use of space in the central area. Residential parking is given priority with restrictions falling heaviest on commuters rather than visitors. Commuter parking will be reduced from 21,000 to 17,000 spaces and visitor's parking from 10,500 to 9,500 spaces. Remaining parking spaces will be relocated from the center towards the periphery, parking charges will be increased and public transport improved (Section 10.4.3).

United States

Parking management was first introduced in the United States in the early 1970's by the Environmental Protection Agency as a means to reduce automobile use. Parking management strategies were made a part of the transportation control plans required by the Clean Air Act of 1970. The initial hesitancy expressed by the planning and business community as to the effects of these strategies has gradually been replaced by their acceptance as a means of achieving desirable transportation and planning goals. DOT has included the management and control of parking as one of the transportation systems management (TSM) regulations, thereby enabling areas to use DOT funds for development of parking plans.

Today, many areas are using parking management as a part of their overall TSM effort. A 1977 survey of 173 U.S. cities by the Virginia Highway and Transportation Research Council found that five of the responding cities had parking management programs, 27 had concluded parking management studies and 38 indicated the studies were underway. A study by the Transportation Systems Center found that 23 of 40 cities either now have or are in the process of developing on-street residential sticker parking programs. This form of parking management is covered more fully in Section 6. Communities' objectives in promoting parking management have included the reduction in automobile traffic and the alleviation of its associated negative impacts, the encouragement of non-work travel to CBDs to promote economic growth, and the more efficient utilization of existing parking facilities.

Parking management tactics can be classified as on-street parking supply tactics, off-street parking supply tactics, pricing tactics, enforcement and adjudication tactics and marketing tactics. Table 2.3 identifies the individual tactics included in each category.

Portland (Oregon) affords an excellent example of a city that has instituted a comprehensive parking management program as a result of the EPA regulations. In Portland, carpoolers and vanpoolers are provided preferential parking at any of the 2,615

TABLE 2.3

PARKING MANAGEMENT TACTICS

ON-STREET PARKING SUPPLY	OFF-STREET PARKING SUPPLY	PRICING	ENFORCEMENT AND ADJUDICATION	MARKETING
• Add or Remove Spaces • Change Mix of Short and Long-Term Parking • Parking Restrictions - Peak Period Restrictions - Off-Peak Restrictions - Alternate Side Parking By Time of Day and/ or Day of Week - Permissable Parking Durations - Prohibitions on Parking Before Specified Hours • Residential Parking Permit Programs • Carpool/Vanpool Preferential Parking - Carpool/Vanpool Meters - Carpool/Vanpool Stickers • Loading Zone Regulations - Bus - Taxi - Delivery - Diplomat	• Expand or Restrict Off-Street Supply in CBD and Activity Centers - Zoning Requirements • Minimum Requirements • Maximum Requirements • Joint Use - Constrain Normal Growth in Supply • Maximum Ceiling (i.e., Freeze) on CBD Spaces • Reduced Minimum Parking Requirements Through HOV and Transit Incentives • Restrict Principal Use Parking Facilities - Construct New Lots and Garages • Change Mix of Short and Long-Term Parking • Restrict Parking Before or During Selected Hours of the Day • Fringe Parking • Park-and-Ride Parking (Intermodal) • Preferential Parking - Carpool/Vanpool Parking - Handicapped Parking - Small Vehicle Spaces	•Change Parking Rates - Increase Rates • Parking Price Increase • Parking Rate Structure Revision • Parking Tax • Parking Surcharge - Decrease Rates - Free Parking in CBD - Differential Pricing Programs • Short-Term vs. Long-Term Rates • Carpool/ Vanpool Discounts • Vehicle Size Discounts • Geographically Differential Rates • Monthly Contract Rates • Merchant Shopper Discounts - Stamp Programs - Token Programs • Employer Parking Subsidies - Reduce Subsidies - Transit/HOV Subsidies	• Enforcement - Non-Police Enforcement Personnel - Ticketing - Towing - Booting • Adjudication - Administrative - Judicial	• Advertising - Brochures - Maps - Media • Convenience Programs (i.e., Monthly Contracts)

Raymond Ellis et al., Parking Management: Synthesis of Current Experience, Peat, Marwick, and Mitchell & Co., Washington DC

downtown parking meters with the purchase of a $15 permit. This program, which is administered by the local transit authority and the city exempts ridesharers from the six hour parking limit. Permit holders do not have to pay the meters which would be considerably more costly. A survey indicated that 58 percent of the program's participants were new carpoolers, half being former bus riders. Other price incentives include a 60 cent per hour straight line basis for short-term parking and a merchant parking validation program.

Portland has combined a no minimum parking requirement with a low maximum allowable parking limit to restrict the growth of CBD parking. One space is permitted per 1000 square feet. There is also a limit on the total number of spaces in the CBD including on-street and off-street municipal and private spaces. New Portland municipally-owned facilities are frequently intended for short-term parking and the first level is dedicated to commercial and retail use. There are fringe park-and-ride lots well served by transit.

Portland has strict enforcement policies, employing 24 civilian parking control aides. The $.4 million cost of the enforcement program brings in $1 million in fines per year. The city has developed promotional materials to acquaint parkers with the location, rates and other information on parking facilities. Newspaper advertising is used to promote downtown shopping.

Several cities, such as Boston and Washington, have implemented aggressive parking enforcement programs. These include civilian parking control aids employed by the traffic and parking department, rather than the police department, agressive towing, widespread use of the "Denver" boot which immobilizes delinquent vehicles, and adjudication by traffic department courts rather than city criminal courts (Washington).

A parking pricing demonstration is about to be implemented in Madison, Wisconsin, during the fall of 1979. The intention is to impose a surcharge on vehicles entering city-operated parking lots during the morning peak. The objectives of the demonstration are to discourage single-occupant auto use by commuters, prompting them to shift to transit or carpools, and to retain spaces for the later arrival of shoppers. Prior to the institution of the surcharge, two complementary transit policies will be implemented. First, for a period of three months, a monthly bus pass will be offered at a discount to a limited number of downtown employees. Second, four new park-and-ride lots will be built, offering shuttle bus service to downtown. Thus, commuters will be simultaneously discouraged from driving and encouraged to use transit.

There are ongoing initiatives for several other road and parking pricing demonstrations. One is an expansion of Seattle's carpool incentive program which offers reduced parking charges to carpoolers. This implicitly creates a disincentive to single occupancy vehicles. Two others, tailored to specific local problems in Santa Cruz and Hermosa Beach, California, will require the display of a special permit for parking in residential and downtown areas. Both of these recreational communities are faced with the problem of visitors absorbing nearly all parking in areas within walking distance of the beach. Visitors would be allowed to purchase a permit, available free to residents. They would also be offered the alternative of parking in a peripheral lot and riding a shuttle bus to the beach front. Again, the approach is one of introducing a transit incentive to complement the parking pricing policy.

2.4 Road Pricing

Road pricing refers to the charging for road use by moving vehicles and includes cordon pricing, supplementary licensing and electronic road pricing. Cordon pricing means that vehicles crossing the boundary of a defined area at specified times pay a charge, either a toll collected at boundary points or a pre-purchased ticket displayed in the window. Vehicles already within the cordon at the time charging starts do not have to pay.

Supplementary area licensing requires drivers to purchase additional daily or monthly licenses and display them on their vehicles when entering, driving within or parking within a specified area. Electronic road pricing entails automatic charging for road use each time a vehicle passes a sensor.

Road pricing can be used to discourage auto use to heavily congested areas of the city during certain periods of the day in order to diminish congestion, improve the environment and force drivers to pay the true social costs of their trips. The schemes can be designed to give preference to ride-sharers, public transport, emergency vehicles, disabled drivers, residents and delivery vehicles.

Road pricing was first introduced in Singapore in 1975. The goal of the area licensing scheme was to reduce peak-hour traffic by 25 to 30 percent. Licenses costing $1.75 a day or $35 per month must be displayed by vehicles other than buses, commercial vehicles, carpools with four or more occupants and motorcycles. Taxis pay half the fee for private cars. The restrictions operate from 7:30 a.m. until 10:15 a.m. The scheme also includes park-and-ride lots, shuttle buses and increased parking charges (see Appendix III).

Europe

London is the only European city that has been contemplating central area road pricing similar to that first introduced in Singapore in 1975. The GLC's area control scheme covers a six square mile area. A $1 per day daily or monthly pass will be required to cross into the area. Goods vehicles will be excluded. The proposal has been met with political opposition and implementation appears at least several years away (Section 11.3.2).

United States

The SMD program has spent the past two years looking for a site for a demonstration in the area licensing form of road pricing similar to that found in Singapore and proposed for London by the GLC. UMTA would pay for pre-planning, permits, enforcement, administration, transit expansion, signs, information materials and evaluation. At least 15 cities have received information on the concept including a letter from the Secretary of Transportation. Only three sites initiated a preliminary study and all three proposals have been terminated because of objections from the public at large, the business community, and key decision-makers. Major objections included: interfers with right to travel, harms business or business image, and discriminates against the poor. Other objections included: hard to enforce, overloads transit facilities, relocates traffic problems, and requires legislative clearance.

SMD currently has plans to study the technical and economic feasibility of a corridor pricing scheme in Honolulu. Two booklets informing them about the SMD program in this area will be mailed to cities throughout the U.S. One booklet will deal specifically with issues related to road pricing and parking controls. It is designed for planners, city officials and lay citizens to better understand and grasp the concepts. The second is a solicitation of interest that describes the demonstration program and the resources dedicated to this effort.

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3. TRANSIT INTEGRATION

The essence of transit integration is that all transit modes should complement each other and work as one unified system. In an integrated system, the function of each transit mode -- bus, rapid transit, commuter rail, ferry -- is well defined, and the most efficient mode is chosen for each type of travel. Routes fit together into a single interconnected network so that one ticket carries a rider from origin to destination regardless of how many transfers are made. Schedules are coordinated so that a passenger can board a bus within a few minutes of stepping off a commuter or rapid transit train. Intermodal terminals, platforms, and curbside stops assure the passenger of quick and easy transfers. The routes and schedules of all modes are well publicized, and printed information is readily available to all residents and visitors. Funding for different providers is coordinated by one agency.

Transit integration is one part of the broader goal of comprehensive intermodal integration, which encompasses all urban transportation modes. In a fully integrated system, taxis and other paratransit modes offer services which complement transit. Pedestrian movement and access to transit vehicles are facilitated through the provision of separate rights-of-way. The movement of trucks and other urban goods vehicles do not unduly interfere with passenger mobility.

Europe

Public transportation in the medium and large-sized European cities is an enormous undertaking, often including several modes and a multitude of public and private operators. Yet, with this complexity it is not unlikely to find a highly coordinated system including schedules, fares, transfer facilities, marketing activities and funding. The ultimate goal is to serve the user in the most convenient way possible by breaking down the barriers between modes and providers.

Sometimes the presence of a strong central government facilitates this coordination. This has been the case in Paris where in 1959 the Government created the Paris Transportation Syndicate (STP) to be responsible for the organization, technical coordination and financing of all public transportation in the region. The STP is responsible for determining the tariff structure among modes (city and suburban bus, metro, and commuter rail) and the operating budgets of the public transit providers It approves and coordinates all capital investments and changes in the system and has played an important role in the interconnection of several of the commuter rail lines. It also

administers the regionwide monthly prepaid fare card (Sections 7.2 and 7.5).

Munich's MVV is even more powerful than the STP. Owned equally by the city and the German Federated Railroads and with additional board members from the Bavarian and National Ministries of Transportation and Finance, the MVV sets fares and schedules, planning and investment policy, revenue distribution, and advertising for all public transportation in a 1,000 square mile region. This has resulted in an exceptionally high level of service experienced by the user: the U-Bahn (subway) and S-Bahn (regional rail) adhere faithfully to published schedules; there is immediate bus and train transfers; a fare card is available for all modes within the system; and a regionwide marketing campaign actively promotes use of the system (Section 8.2.2).

An important component of transit integration is the fare systems employed. With the joining together of the regions' fragmented private operators and in response to rising labor costs and decreases in productivity due to one-person operations, the majority of European transit operators are now using some form of self-service fare collection in which the passenger determines and pays the appropriate fare and a team of inspectors controls violations.

There are three prototype self_service configurations operating in Europe, although the actual details vary according to the operator's specific needs. In the Swiss system, the issuing and validating equipment is installed at stops only (Geneva). The German system utilizes validating equipment installed on the vehicles and ticket issuing equipment installed at the stops (Munich). In the Continental system, validating equipment is installed on the vehicles but little or no use is made of ticket issuing equipment (Paris).

Many self-service systems permit all-doors access to vehicles, and operators report approximately a 10 percent service productivity improvement (Geneva and Cologne). Extensive use is made of high capacity surface vehicles such as articulated buses and LRVs and trains of LRV's in which there is only one transit employee, the driver of the lead vehicle. Passengers embark and disembark through the numerous wide double doors which are often passenger operated. In Gothenburg, for example, one-driver trains of up to four 120 passenger vehicles are possible on the Angered LRV line (Section 10.6.3).

If permitted at all, the purchase of tickets from the driver of a surface-vehicle is discouraged by charging a higher fare than if the ticket had been purchased off the vehicle. In Paris, for example, the cost of a bus ticket when purchased in a

Boarding and Alighting at All Doors in Gothenburg

Self-Validation in Paris

Barrier-Free Entry in Munich

Fare Machines at a Munich LRV Stop

"carnet" of ten in any Metro station is half that of a ticket purchased from the driver.

Regional integration usually results in the need for the replacement of the area's various flat-fare structures by a zoned-fare structure covering the entire region. Since it is the user who determines the appropriate fare and does so before boarding the vehicle, self-service fare collection greatly simplifies the procedure. Fare structures can be introduced that more closely reflect the cost and value of the service received such as the "Carte Orange" in Paris which divides the region into five concentric zones and equalizes fares for equivalent journey lengths. Transit ridership can be increased by offering a diverse fare structure with a variety of incentives and discounts designed to appeal to broader segments of the population. In Cologne, for example, fare options include multi-trip tickets; daily, weekly, monthly and yearly passes; and discounts for students, the elderly, the handicapped and other user groups.

The Dutch have taken the concept of fare coordination one step further and have been developing a national fare policy. The National Railway now has a family fare card designed to make inter-city rail competitive with the automobile for families travelling together (Section 9.8.2).

United States

Steps have recently been taken in the United States to achieve better regional coordination, mainly through prepaid regionwide pass programs. Chicago's Regional Transportation Authority (RTA) has proposed an intermodal regionwide pass demonstration program. The RTA's six-county district includes 3,700 square miles and seven million inhabitants. Public transportation in the Chicago metropolitan region is a complex network of facilities and service provided by both public and private operations and municipally financed systems. The region's public transportation services are provided by seven commuter railroads, the Chicago Transit Authority (bus and rapid transit), and 29 suburban bus systems. The RTA has the legislated authority to levy various taxes, issue bonds, and approve or veto any transit related expenditure in the region.

The regional fare system has already been standardized. The multi-modal pass has been proposed since a majority of public transit riders use more than one mode of transit on a daily basis. Three types of passes are being considered: 1) a pass that can be used on bus and rail rapid transit service in conjunction with commuter rail service; 2) a pass that can be

used on all regular bus and rapid transit service; and 3) a pass that can be used on most local and feeder bus routes.

Initially the monthly passes are to be sold at 100 key locations throughout the region. They will be priced at essentially the full fare monthly work trip. The intermodal passes are expected to increase transit usage during the off-peak periods, make transit use more convenient, increase system understanding and multiple-mode use, improve the cash flow for the RTA, and help simplify the administration of fare collection. During its 18 month demonstration period it is estimated that 100,000 passes will be sold per month and that the net revenue loss (total regionwide transit revenue lost through the introduction of the pass minus the additional revenue generated through new ridership) will be $75,000.

Six major public transit agencies provide service in the San Francisco Bay Area. Each is jurisdictionally independent, and therefore sets fares in response to its citizens and its policy board. A high level of informal cooperation exists among these six operators, and the Metropolitan Transportation Commission (MTC), the regional transportation planning agency, promotes coordination through its fund allocations. However, formal integration of fares has not been attempted.

More active interest in transit coordination has grown over the past few years with the concerns over performance measurement, productivity improvement and increasing public subsidy for operations. In the Bay Area, this interest was expressed in the formation of the Regional Transit Association (RTA), a voluntary organization of the six major public transit agencies. The RTA Board, composed of the six general managers, meets monthly to discuss issues of joint concern. The Board assigns coordination tasks to several committees made up of agency staff in specific functional areas, such as public information or procurement.

Almost concurrent with the formation of the RTA was the establishment of the Transit Operator Coordinating Council (TOCC). The TOCC, called for in state legislation, serves as an advisory body to the MTC. The Council includes the six general managers plus the executive director of the Commission.

A joint fare prepayment demonstration in the Bay Area will help the MTC and the operators take a step toward a more integrated transit system. The issues in developing a fare prepayment demonstration are virtually identical to those of long-term fare integration. The MTC and the operators hope the demonstration will provide valuable information for future efforts.

The MTC is currently exploring possible alternatives of a prepayment plan that has the best possible chance for success. The objectives of the demonstration design phase are:

(1) To create a process for cooperatively identifying the issues each operator sees in creating joint prepayment plans.
(2) To conduct analyses which identify the most likely markets for prepayment, and to match prepayment methods to these markets.
(3) To develop financial management methods for ensuring that prepayment does not adversely affect costs, revenues or the level of public subsidy.
(4) To define the demonstration's implementation phase in a manner which meets the needs of those operators who choose to participate and which leaves the door open to later participation by those who do not.

There are several objectives to be achieved during the implementation phase. With a variety of fare structures and payment methods in use by each transit operator, current transit users must cope with a confusing and inconvenient system, while potential users may be totally discouraged from travelling. One of the objectives of implementing prepayment would be to test traveler response to a simplified system of multi-operator fares. Possible responses are increased use of transit by present transit users or new patronage. Even if no new transit users are immediately attracted by prepayment, a second objective might still be achieved: increase in speed and efficiency by eliminating boarding delays due to cash fare payment. Another related objective could also be achieved: reducing operating costs due to cash handling.

On a much smaller scale than the proposed projects in Chicago and San Francisco is the integrated prepayment fare collection system and barrier-free transfer experiment by the Metropolitan Atlanta Rapid Transit Authority (MARTA). In March 1979 MARTA began use of a monthly unlimited ride pass on the bus system. With a price equivalent to 40 transit trips ($10), this "transcard" is now also valid on the newly opened Metro. Since MARTA has a universal system of free transfers between connecting bus lines, transit users who purchase a pass and must make a transfer are not required to obtain a transfer slip from the driver of the initial bus boarded nor do they have to carry the exact boarding fare. In addition, one station of the MARTA East Line was intentionally designed to allow passengers departing from feeder buses to enter into the rail station without the need for a transfer slip or similar device.

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4. HOV PRIORITY TREATMENTS

4.1 Introduction

Heavily congested roadways have resulted in increased travel times and decreased schedule reliability for surface transit in both European and American cities. In an attempt to improve the level of service and make transit more competitive with the automobile, high occupancy vehicle (HOV) priority treatments have been implemented including reserved bus lanes, exclusive rights-of-way for LRVs and buses, and priority signal systems. Often a prioritization scheme will include both a guideway and a signal component.

4.2 Reserved Bus Lanes and Exclusive Rights-of-Way

Europe

Concurrent-flow and contra-flow bus lanes are found in many European cities. Concurrent flow lanes are generally separated from regular traffic by striping, but contra-flow lanes may be set apart by a raised curb and even parking as in Lille, France. Contra-flow lanes require careful pedestrian signing. In Paris chains are used to ensure that pedestrians cross only at crosswalks. Contra-flow lanes have been used to retain the original route of a bus service along a newly created one-way street so that the outward and return routes are not separated.

Bus lanes may be used primarily as queue jumps at congested intersections as in London (Section 11.4.5) or for major route segments as in Paris. The largest system of reserved bus lanes in a European city is found in Paris with 95 kilometers (60 miles) in the city and 53 kilometers (33 miles) in the suburbs. About 25 percent of these are contra-flow lanes (Section 7.5.4).

Violations are often a problem with the concurrent-flow lanes but can be overcome by appropriate police action. This occurred in Paris where during the late 1970's the reserved lanes were less and less respected by automobilists who drove and parked in them. Following a month long publicity campaign in the media and the placement of prominent red signs on the fronts and backs of buses requesting motorists to obey the reserved lanes, the police began enforcing the restrictions. The fine for driving in a reserved lane was set at $29 and that for parking in one at $60. The enforcement program appears to have been successful.

Reserved bus lanes cause the removal of on-street parking spaces and may decrease auto access to some establishments. By contrast, they are inexpensive to implement, result in an increase in level of service primarily by increasing schedule

Amsterdam

Gothenburg

LRV Reserved Rights-of-Way

Contra-Flow Bus Lane in London

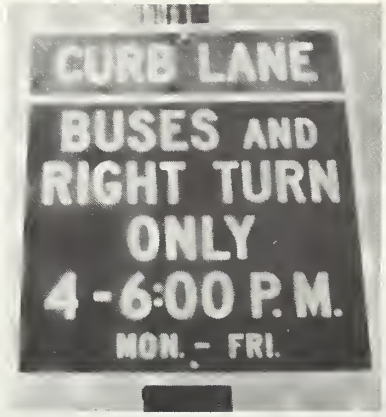
Sign on Paris Bus Requesting Motorists to Obey the Reserved Lanes

Contra-Flow Bus Lane in Paris

Contra Flow Bus Lane in Houston

Paris

Paris



San Francisco

Reserved Lane Signing

address and phone number; parking for church or school functions was allowed if a telephone request was made to the police department; Sunday was omitted from the restricted period; stickers were issued to residents of rented vehicles who met the resident requirements, and students were required to register their cars in Massachusetts to qualify for a sticker.

The sticker program has been expanded each year until by the end of 1978 ninety percent of eligible streets had been posted with 5000 signs. The number of parking control officers has been increased from two in 1972 to 25 in 1978 to enforce the program. Revenue from the citations they issue more than offsets their cost to the City.

Due to the effectiveness of the program, available parking spaces are more than sufficient for resident requirements. The City is contemplating instituting alternate side parking to facilitate street cleaning, snow plowing, the identification of stolen or abandoned cars, and to return more of the street area to the people (see Section 6.4).

San Francisco is in the process of implementing a major residential permit parking program throughout the city. In August 1977, a small area (seven blocks) around the Daly City BART station became the first restricted district. Parking was limited to two consecutive hours except for those cars with a resident sticker. The yearly cost for the sticker is $10, and it must be affixed to the rear bumper of the resident's automobile. The initiative was taken by a single resident who obtained the necessary signatures on petitions. The Daly City station is at the end of a BART rapid rail line and is the station closest to San Mateo County, a major residential area for commuters working in San Francisco. Freeway I-280 provides easy access from the San Mateo Peninsula to Daly City, and commuters had been filling all available parking spaces on the local streets around the station. Several months after the parking prohibition went into effect, a multi-story parking garage providing free parking was opened adjacent to the BART station. However, the number of spaces in the garage was inadequate to serve the commuters, and the parking ban remains in effect.

A major residential parking district was implemented in March 1978 in the Telegraph Hill-North Beach-Russian Hill neighborhood of San Francisco. This area is within a mile of the CBD, is densely populated, has little off-street parking, and has excellent transit access to the CBD by bus, trackless trolley, and cable car. Commuters from Marin County (to the north of San Francisco) coming over the Golden Gate Bridge had found it convenient to park here and ride transit to work. In fact, a study conducted by the San Francisco Department of Public Works

found that 68 percent of the vehicles parked in this neighborhood during the day came from outside the area.

The parking restrictions are in effect from 8:00 a.m. until 9:00 p.m., Monday through Saturday. A resident must purchase a registration sticker for $10 and affix it to the back bumper of his car. Initially, guest passes were to be sold for $1 for a 14-day pass. However, the City was afraid that these passes would be abused (given or sold to commuters) and the police claimed that there were no available means for enforcement, so it was decided not to issue any guest passes. As a result, guests planning to stay more than two hours cannot arrive before 7:00 p.m. (two hours before the restrictions end). San Francisco currently has about ten parking zones throughout the city, all located around major activity centers such as schools, hospitals and rail transit stations.

The Washington, DC residential permit parking program is currently in effect in over 20 areas of the District. The District is divided into eight zones and a sticker issued to a resident living in an affected area is good in all affected areas within the same zone. However, it is not valid in any of the other seven zones. The permit parking restriction is in effect from 7:00 a.m. to 6:30 p.m. on weekdays, except holidays. Persons without a permit can park for no more than two hours on a restricted street. The sticker, which costs $5 per year, is affixed to the car's rear window and contains the license plate number of the vehicle. Two fifteen-day visitor permits may be obtained free by each household. One-day permits are issued in unlimited numbers. Students and other temporary residents are eligible for stickers, but only if they can prove that they are actual zone residents and meet the District's requirements for vehicle registration. The primary reasons for the parking bans are major attractors such as universities, hospitals and transit garages, transit transfer points, and proximity to the CBD.

An impact analysis was carried out in the Friendship Heights area. Total vehicles parked on the streets decreased by 56 percent from 1140 to 501 after the program was implemented. It is interesting to note that while the number of non-Washington vehicles declined by 62 percent (713 to 270), vehicles with Washington plates declined by 45 percent (427 to 231) indicating the large number of commuter trips made within the city.

6.3 Traffic Restraint Devices

The second technique, traffic restraint devices, consists of physical or regulatory measures placed on residential streets to inhibit the flow of through-traffic and to divert this traffic to designated arterials on the periphery of the protected traffic cell or environmental area. Some of the more common and effective restraints are: "stop" signs to slow or discourage traffic, diagonal diverters and semi-diverters at intersections, and barriers to create cul-de-sacs.

Europe

A traffic restraint scheme was introduced into Ostermalm, a 70 block mixed commercial and residential quarter of Stockholm. Housing 19,000 people and providing jobs for 23,000 more, the area has a gridiron street network and is served by several bus routes and three subway stations.

The objectives of the City Council in improving the environment of Ostermalm were to eliminate through-traffic unless by bus, bicycle or foot, to create additional safe space for pedestrians, and to improve the regularity of the buses. These were achieved by dividing the area into three cells that private cars could only enter or leave via "gates" on the peripheral roads, establishing a pedestrian mall in one street and introducing bus lanes on the fringe routes.

Before-and-after studies showed that these measures reduced traffic within Ostermalm by 40 percent (from 120,000 to 70,000 vehicles per day), accidents by 30 percent and both air pollution and noise by measurable amounts. Accidents also declined by 25 percent on the peripheral routes as a result of steadier traffic flows and fewer conflicts resulting from the closing of several side streets and the rearrangement of intersections. The cost of the scheme was $443,000 for the experiment and $2 million for the permanent improvement of paving, lighting, etc.

South Fulham in the London Borough of Hammersmith is an upper income residential area fringed by industry. In order to reduce through truck traffic, a traffic management scheme consisting of two road closures and five width reductions was implemented in 1976. The number of heavy goods vehicles using two short-cut routes fell by 60 and 40 percent respectively.

As in the case of CBD pedestrianization, these neighborhood division schemes cause through traffic to seek new routes around the area. Therefore, the size of the area, the amount of traffic redirected, and the types of activities along the diversion routes must be considered during the planning stage.

In Gothenburg the original five cell system is being expanded to include the entire central urbanized area which contains several residential neighborhoods. The creation of such a system giving the desired priority to public transport and pedestrians and without causing heavy traffic congestion elsewhere is seen as impossible without a corresponding reduction in car traffic volumes in the area by an estimated 20 percent. It is proposed to achieve this level of traffic restraint by restricting parking and improving a bypass route for through traffic (Section 10.4.3).

United States

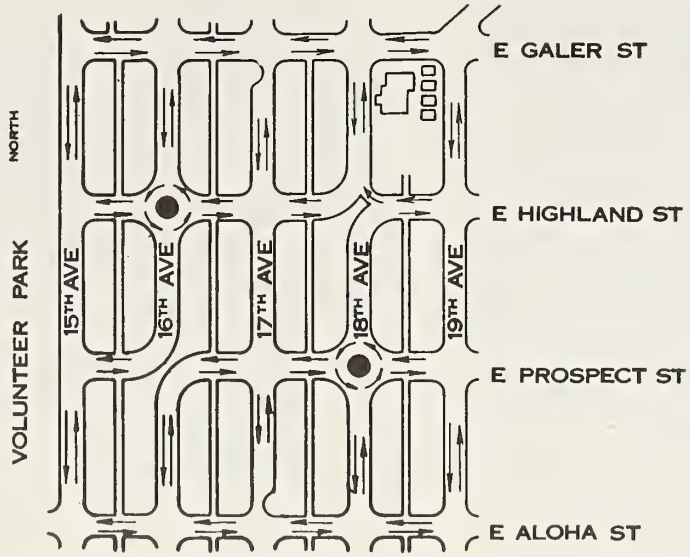
Most of the neighborhood traffic restraint schemes implemented in the United States have occurred in relatively less dense cities. These cities usually have a grid street pattern and sufficient reserve street capacity to accommodate the diverted traffic without causing serious congestion. In the cores of the denser, older cities such as New York, Boston or Philadelphia no such district-wide programs have been tried.

Two cities making major use of traffic diversion devices are Berkeley, California and Seattle, Washington. Berkeley, which covers an area of 10.6 square miles, is eight miles to the northeast of San Francisco. Most of Berkeley is on a grid system with major arterials and collector streets providing access to all areas of the city. In August 1975 the city-wide Berkeley Traffic Management Plan was implemented including 74 diverters, 179 "stop" signs, 10 chokers, 40,000 feet of striping, 4,500 feet of concrete and asphalt islands and other traffic restraint measures.

Seattle has been implementing neighborhood traffic managment schemes on a neighborhood by neighborhood basis since 1971. Since most of the city's residential subdivisions are plotted in grid configuration, vehicle restrictive devices have been used to channel vehicles onto the major arterials which are spaced at one-half mile intervals.

The impacts obtained under these programs produced no major surprises. Local street traffic decreased considerably on the streets with the restraining devices. Arterial traffic increased slightly on the periphery of the neighborhoods, but these increases could be handled with relatively minor (and thus low cost) traffic management devices and caused no serious adverse impacts. Changes in overall travel times were minor but seemed significant to those who lost their accustomed shortcuts. Actual impacts on public services and deliveries were minor but caused some stress among those who objected to the forced adjustment. The accident rate decreased dramatically in Seattle while

Residential Traffic Restraint in Berkeley



Seattle's Stevens Neighborhood Traffic Restraint Plan

Berkeley reported some collisions with the traffic management devices and continuing vandalism and confusion. While no systematic studies of changes in neighborhood perception, cohesion and activity pattern are available, the Berkeley residents living on the non-traffic streets have been pleased with the results, and the Stevens neighborhood in Seattle reported improvements of all these factors.

Nearly all of the American traffic restraint projects relied strongly on local initiative by the affected neighborhoods. The neighborhoods provided the political pressure while the city government supplied technical assistance. The partnership of these two elements was generally carried through the planning, review, demonstration, evaluation and permanent implementation stages. Generally the organized and concentrated political support of the neighborhood (often in alliance with other neighborhoods with similar programs) has prevailed over the more diffused opposition of those who may have been inconvenienced. In some cases this latter group consisted of commuters from outside the municipality who had no political leverage in decisions controlled by the city. Even in Berkeley where the main opposing group was located inside the city, the traffic restraint program survived two successive popular referenda.

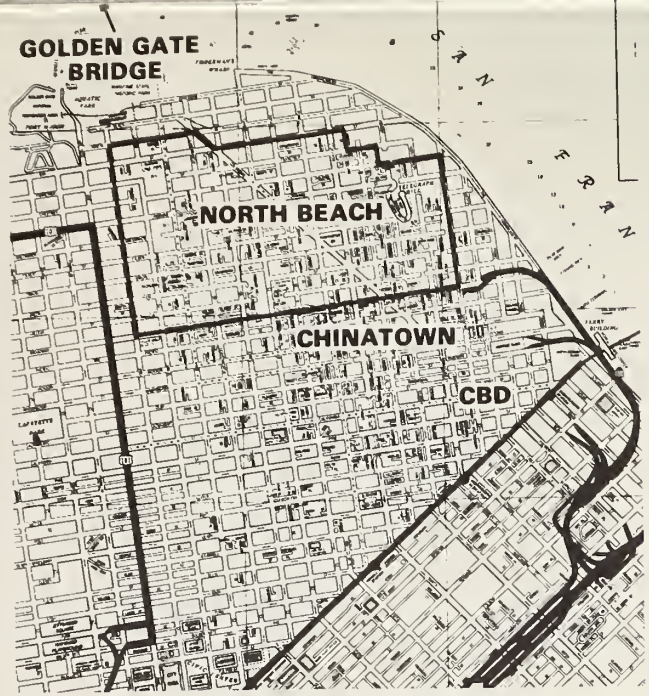
The compensatory programs at most sites were limited to relatively minor traffic management measures. These appear to have been sufficient due to the traffic carrying capacity of the street system.

The neighborhood traffic restraint schemes are highly suited to the prevailing planning and political styles of American cities. Such schemes can be identified with the interests of a specific constituency that can effectively lobby for them through local politicians. They are relatively inexpensive and can be implemented quickly. For these reasons they have been gaining in popularity during the past several years.

6.4 Woonerven

Europe

In most cases in both Europe and the United States the appearance of the residential streets that have been freed of through traffic has been left unchanged and the created space remains uninteresting and uninviting. The Dutch, however, have taken these traffic diversion schemes one step further with the development of the "woonerf" or town yard in which the appearance of the street is changed from a traffic route into a paved public garden. The automobile is tamed but not excluded and the street is opened to multiple use - a place to meet friends, a safe area



San Francisco's North Beach
Parking Permit District

Pimlico (London) Traffic Restraint

Delft "Woonerven"

for children to play, a pleasant environment in which to walk. Vehicular traffic is slowed by narrowing the width of the roadway, putting in sharp turns, and installing speed bumps and other obstacles such as bollards, trees, benches and lined parking spaces. The space between the buildings is resurfaced with no distinction made between sidewalk and roadway to encourage pedestrians to use the entire width. Amenities such as trees, benches and bike racks further increase the feeling that the entire space is meant to be used by the pedestrian (Section 9.7). A similar concept has been developed in Essen, Germany.

United States

Restraint schemes similar to the Dutch "woonerf" have been proposed in Cambridge and Boston. Cambridge is in the process of applying the woonerf concept to two one-way streets on either side of an elementary school. The Mid-Cambridge neighborhood has little open space and the children are forced to play in the central cement courtyard or on a few feet of lawn on either side of the building. The Recreational and Environmental Precinct will extend this play area into the streets where vehicles will be discouraged through the use of signs and speed bumps.

The City has had several meetings with the Mid-Cambridge Association of Citizens and a four person committee from the Association is working directly with the planning office. A representative from the Public Works Department is in attendance at all the meetings. Cambridge has applied for a Heritage Conservation and Recreation Service grant (U.S. Department of Interior) under the Urban Parks and Recreation Recovery Act. The grant request is for $102,000 with a 30 percent match by the city.

The Boston Department of Traffic and Parking has developed the following tentative set of criteria for the establishment of woonerven in that city: primarily a residential street with services nearby; existence of or ability to form a neighborhood association; significant neighborhood support; design maintains the existing number of parking spaces; parking is limited to residents of the street; displaced traffic will not adversely affect other residential streets; pedestrians have the right-of-way; and vehicle speed is limited to five to eight miles per hour. To date five streets have been identified as promising candidates. Preliminary designs have been completed and neighborhood meetings held. The final designs will be carried out by the Boston Department of Public Works to ensure that street cleaning and snow removal can be readily accomplished.

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7. PARIS

7.0 Summary

	Population	Area	Employment	Motorization
City	2.3 million	40 square miles	1.95 million	3 million cars
Region	10 million	4,610 square miles	4.75 million	3.5 persons/car

Paris is the political, economic, commercial, cultural and touristic center of France. With 19 percent of the country's population and a large proportion of high level jobs, the Paris region has traditionally been kept under the tight control of the national government. While administrative reforms towards decentralization that began in 1967 have resulted in an elected regional council as well as the first mayor Paris has had for 100 years, most decisions affecting transportation are made by the national government or the government appointed Prefect of the region.

Transportation policy during the 1960s favored the automobile with new national road systems, urban underpasses, one-way street networks, underground parking facilities, and even an expressway along the right bank of the Seine. High-rise office and apartment projects representing an abrupt change in the architectural tradition, were authorized within the limits of the City of Paris. In order to satisfy the demand for office space, apartments were converted to offices, leaving those areas deserted after working hours. The charm and excitement that had taken centuries to create was being systematically destroyed.

Fortunately the 1970s have seen a major reversal in transportation and land use policy in the Paris region. Road construction has been replaced by an even more aggressive policy for the improvement

of public transportation and the encouragement of its use. As a result, the Parisian public transportation system, which includes a dense network of suburban railroads, regional express railroads, metro, and public and private bus services, is one of the finest in the world. Travel within Paris and from the suburbs to Paris is dominated by public transit. Most intra-suburban trips, however, are made by the automobile. The public transportation system is not accessible to the seriously handicapped.

The region's accomplishments include major capital investment projects as well as transportation systems management innovations. A regional plan, in which transportation is seen as a major tool for achieving desired land use objectives, was developed in 1965 and serves as the basis for all changes in the region's transportation system, the refocusing of suburban development, the creation of five new towns in the outlying areas, and the protection of green space.

The Paris travel market has been changing, and major capital investments have been made to the system to accommodate the increasing importance of trips between Paris and the suburbs. Metro lines have been extended and a large portion of the regional rapid rail system (RER) has been completed. In order to decrease transfer and travel time, the RER and some of the suburban commuter lines are being interconnected to form a unified rail system that includes direct links between the two airports and the five new towns and that passes through the center of Paris with several Metro transfer points.

Concurrent with this emphasis on capital intensive solutions has been an equally strong and important emphasis on low-cost innovations. The orange fare card can be purchased on a monthly or yearly basis and is valid for all trips on any public transit mode within the region or a subset of the region. It has encouraged a greater and more rational use of the entire system.

On a per trip basis the card is priced considerably below the normal fare, and a transport payroll tax paid by employers (2% of wages) is used to cover this loss in revenue as well as to provide investment capital. The 60 miles of reserved bus lanes in Paris and 33 miles in the suburbs have resulted in an average speed increase of 5 per cent and a large increase in reliability.

Paris has two major pedestrian areas, a three block by four block section of the Latin Quarter and a four block by six block zone in Beaubourg. Both are surrounded by broad boulevards and are characterized by narrow streets filled with pedestrian activity. Several other pedestrian areas are planned.

In addition to the development of the five new towns, two joint development projects with major transportation components are currently underway - Les Halles situated in the center of Paris and La Défense, just to the west of the city. Both projects represent enormous undertakings and strive for a mixed-use development firmly tied to and dependent upon a rapid and reliable public transportation sytem.

7.1 Background

Paris is the political, economic, commercial, cultural and touristic center of France. The Paris region, known as the Ile-de-France, covers an area of 12,000 sq. km. (4,610 sq. miles) which represents 2% of the surface of France.

The region contains about 10 million inhabitants (19% of the nation's population), including 4.75 million who are employed. Imbalances between population and place of employment exist within the region. The city of Paris covers an area of 105 sq. km. (40 sq. miles) with 2.3 million inhabitants and 1.95 million jobs compared with 7.7 million inhabitants and only 2.55 million jobs in the suburbs. Two-thirds of the population lives in the eastern half of the region while two-thirds of the jobs are in the west. Paris and the inner suburbs contain 80% of the office jobs.

The road network in the Paris region is largely radial in character and focuses on the central area. The 1960's saw the building of major new roads and parking facilities. The city itself is surrounded by an orbital freeway, the Péripherique. Several autoroutes connect Paris with the rest of France and Europe, but these terminate at the Péripherique and do not penetrate the city. The only urban expressway was built several years ago along the right bank of the Seine. Plans to construct an expressway along the left bank have been abandoned.
The number of automobiles in the region has grown from 150,000 at the end of World War II to 3 million today, or about 3.5 persons per car.

Public transportation in the Paris region is provided by a dense system including suburban railroads, regional express railroads, the Metro and both public and private bus services.

The public transport system has been undergoing vigorous expansion and renovation since the early 1970's.

Approximately 19 million trips are made daily in the region and almost a quarter of these are concentrated in the evening peak period. The city of Paris is responsible for attracting or generating 8 million of the total trips made. Private motor cars account for 52% of all trips made daily and congestion on the road network is severe.

Travel within the city is heavily dominated by public modes. Fifty-five per cent of all trips are made on public transit and half of these are by Metro. For suburb to city trips the modal split is even higher, 60% of all trips and more than 80% for work trips. Most of these trips are by rail. By contrast, the modal split for inter-suburban traffic, which accounts for 60% of total trips, is only 15%. These trips are served primarily by bus.

Paris differs from most American cities in several significant ways. There is almost no heavy industry within the city limits and most jobs are of a professional nature. A large proportion of the city's residents are middle and upper class while the blue collar workers tend to live in the suburbs. Finally, the diversity of opportunities and the mixed use development within many sections of Paris make it a 24-hour city - a place where its residents live, work and play. Yet, like many American cities it has been losing population and employment opportunities to the suburbs. As a result, and combined with the effects of inflation (about 9% per year), local taxes have been raised 20% this year and several major public works projects have been postponed (e.g., a pedestrian zone in front of City Hall) or reduced in scale (e.g., a sports stadium).

There are several topics of particular interest:

- the regional plan which contains a major public transportation element
- the quality and innovative nature of the public transit system and its extensiveness
- the fare card valid for all modes of public transportation within the region
- the transportation payroll tax paid by employers
- the system of reserved bus lanes
- the integration of the rail modes
- the pedestrian zones
- two joint development projects, Les Halles and La Défense.

7.2 Institutional Arrangements

7.2.1 Introduction

France is divided into 95 departments, eight of which make up the Paris region, the Ile-de-France. Each department is further divided into communes or municipalities. In the Ile-de-France there are 103 communes, each with an elected mayor and council. The city of Paris is both a department and a commune. Paris is divided into 20 arrondissements or boroughs, each with locally elected officials.

With its large population and major economic influence, Paris has traditionally been kept under the careful watch and control of the strong central government. Along with recent

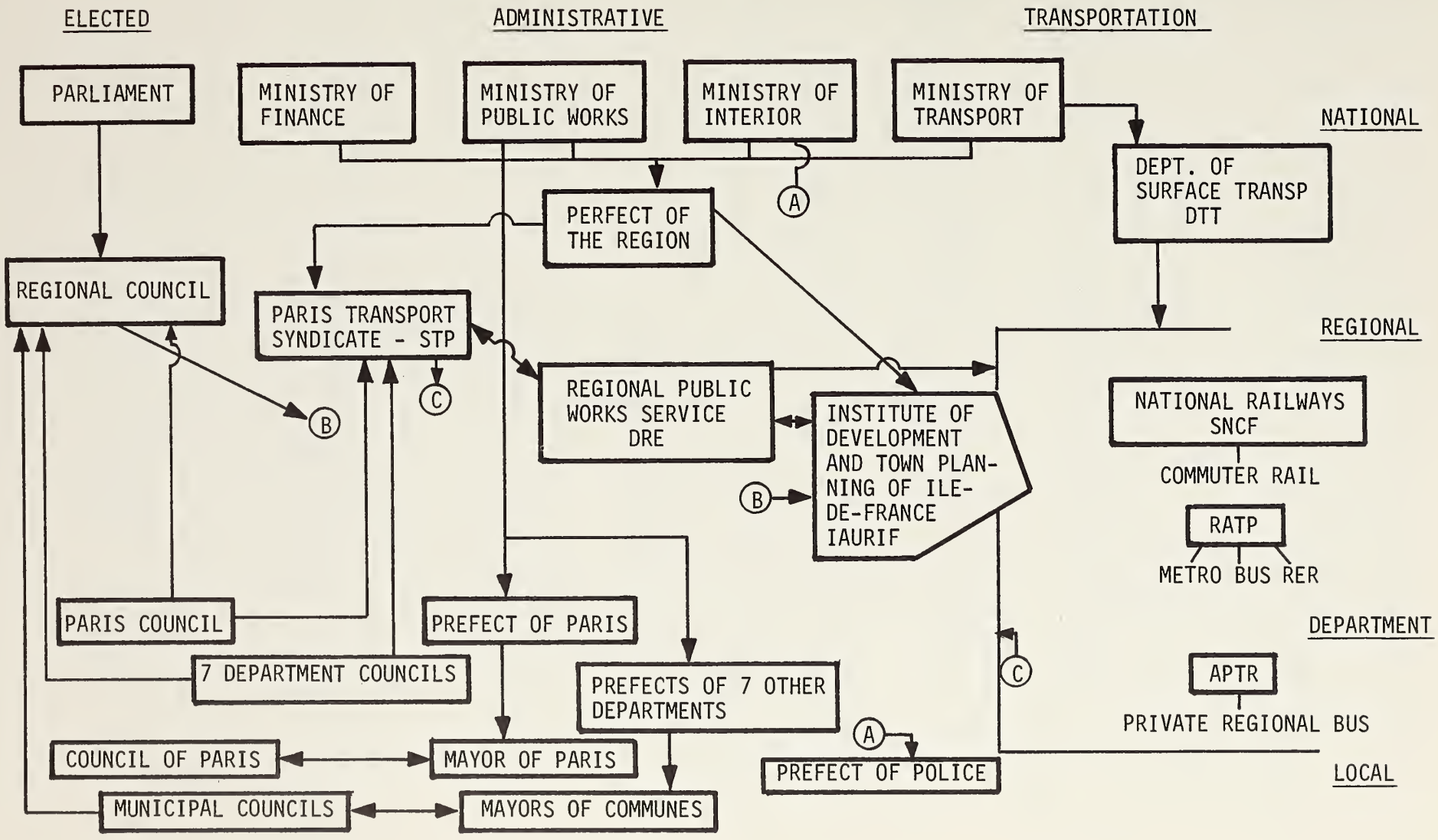
attempts to decentralize the population and employment of the country, efforts are being made to decentralize the governing of Paris and the rest of the Ile-de-France. However, despite the changes that have occurred it is still the national government that exercises primary control over the region. The administrative reform that began in 1967 resulted in the creation of the elected Conseil Regional d'Ile-de-France (the Council of the Region of the Ile-de-France) in 1976 as well as the election of the first mayor Paris has had for 100 years. Yet, the major decision making capability for the region remains with the national government through the Prefecture of the Region and its Prefect, who is appointed by the national government. At the local level the balance of power is less clear.

7.2.2 National Level

At the national level there are three ministries with responsibilities in the area of transportation: the Ministry of Transport, the Ministry of Public Works and the Ministry of the Interior. The Ministry of Transport determines national transport policy while the sub-agency, the Department of Surface Transportation (DTT), is the policy leader for urban transportation. Similar to a combined UMTA and FHWA, the DDT makes statutory, budgeting and political decisions concerning surface transportation - urban and inter-urban passenger and goods transport. The Ministry develops innovative ideas and encourages communities to adopt them. However, it has no formal demonstration program and provides funding for these innovations on the same basis as other local requests.

The Ministry of Public Works is responsible for all road infrastructure construction programs while the Ministry of the Interior plays a major role in formulating policies concerning the road network, manages the distribution of a special roadways investment fund to local authorities, and is responsible for the police. All national funds are allocated through the Ministry of Finance.

PARIS INSTITUTIONAL STRUCTURE



7.2.3 Regional Level

The Ile-de-France consists of eight departments, one of which is the city of Paris. The regional government is charged with contributing to its economic, social and cultural development and is afforded financial means to undertake studies, make decisions on public investments, and finance in part or in full public works projects. The regional government consists of: the Prefect, its chief executive officer; an elected assembly, the Regional Council; and an advisory group, the Economic and Social Committee.

The regional government is dominated by the Prefecture of the Ile-de-France, an administrative body headed by the Prefect who is appointed by the Council of Ministers of the national government and is the executive officer for the region. The Prefect represents the national government in the region and assures the implementation of national policy. The present Prefect is also the Prefect of Paris. Among his duties the Prefect prepares and executes the region's budget, is in charge of producing the region's development plan and presides over the Paris Transportation Syndicate (STP).

In an attempt to bring more political power to the local level the Regional Council was established in 1976. Its 164 members are not elected by direct popular vote but rather are chosen by their respective elected bodies in the following proportion: 33 Deputies and 17 Senators from the National Parliament; 30 councillors from Paris; 42 councillors from the councils of the 7 other departments; and 42 representatives from the communes outside of Paris.

The Council has not been a strong force in regional politics, in part, due to the composition of its members, half of whom come from the national government and half from the local government. The Council's primary function is to vote on the budget.

Created in 1960, the Institute of Development and Town Planning of the Ile-de-France (IAURIF) is a public foundation that conducts town planning and development studies in the Ile-de-France region. Directed by the Prefect, it has been responsible for the development of the region's Master Plan and continues to collect data, perform analyses, forecast developments and make recommendations to the elected councils and administrative authorities in the region.

The Regional Public Works Service (DRE) is under the control of the Prefect and the Ministries of Public Works and Transport and is responsible for infrastructure construction and maintenance and, along with IAURIF, transportation planning.

The two major public transportation providers at the regional level are the RATP (Paris Public Transit Authority) and the SNCF (National Railways), the heads of which are top level political appointments made by the national government. Inter-urban bus service is provided by the APTR (Association Professionnelle des Transports Routiers), a group of 54 private bus companies.

The Paris Transportation Syndicate was created by the national government in 1959 to be responsible for the organization, technical coordination and financing of all public transportation in the region. Before its inception there was no mechanism available for coordinating public transportation on a regional level. The STP's twenty member board of directors is presided over by the Prefect of the Region. The board is composed of 10 representatives from the national government, including the

Ministries of Transportation, Finance, Interior and Public Works and 10 representatives from the departments in the region, five of which are chosen by the Paris City Council. While the city of Paris has been afforded a greater representation than the other departments, it is the national government that maintains the controlling voice over the organization.

The STP is primarily a coordinating rather than a planning organization and, therefore, is less influential than Munich's MVV. While it is the national government that sets the fare level (see Section 7.2.6), the STP is responsible for determining the tariff structure among modes. It was responsible for the supplemental charge for metro extensions beyond the Paris city limits and for the orange card, the monthly or yearly fare card valid for travel on all public transit in the region (see Section 7.5.2). The STP must approve the operating budgets of the SNCF and the RATP (which are then submitted to the national government for final approval) and approves and coordinates all capital investments and changes in the system. It has played an important role in the interconnection of the RER and some of the SNCF suburban lines (see Section 7.5.5).

The principal source of revenue received by the STP is the employer transport tax (see Section 7.5.3) which in 1977 was FF 2,385 million ($570 million). The second largest source of revenue is derived from traffic and parking violation receipts ($8 million in 1977). The principal use of the employer transport tax is to cover the loss in revenue incurred by the transit operators as a result of the orange card which, on a per trip basis, is priced below the cost of a regular ticket. This reimbursement accounted for about FF 1,500 million ($360 million) in 1977. The remaining revenues are used for capital investments, park and ride lots in the suburbs and other operations.

7.2.4 Local Level

The Region's seven departments (not including Paris) have their own elected general council and departmental assembly. Within these departments each commune has its own mayor and city council. Communes allocate funds for the building and maintenance of local roads as well as their share of the public transit subsidy. They have police powers regarding traffic control and management such as traffic lights, parking restrictions, reserved lanes for buses, and pedestrian zones.

In 1976 the national government gave to Paris the same right afforded to the other communes, the right to a mayor. Previous to that the Prefect of Paris, who is appointed by the national government, presided over the city council, prepared the budget, and, in general, acted as mayor. The mayor of Paris is elected by the 109 member city council for a period of six years. He selects administrative assistants and is responsible for preparing the city's budget.

Paris also has a Prefect who is appointed by the national government. He prepares a budget for Paris and is the city's executive officer at the department level. The Prefect has the final say in decisions taken by the mayor and the city council on matters of interest to the national government through the interpretation of national law. In addition the national government exercises control over transportation decisions in the city through the allocation of grants by the Ministries of Transport and Public Works and through the technical planning services of the Prefecture.

The Paris Prefecture of Police, which is directly responsible to the Ministry of the Interior, is in charge of traffic planning and enforcement and traffic management. Thus, it plays a major role in such projects as street pedestrianization and reserved bus lanes.

7.2.5 Sources and Uses of Revenue

The national government has three major sources of tax revenue: a value added tax on all purchases, a personal income tax and a tax on corporate income. The major source of tax revenue for the region is a property tax while the major sources of revenue for the city of Paris are property taxes and taxes on businesses. These monies are all for general use.

The only tax specifically earmarked for public transportation is the payroll tax paid by employers. It accounts for approximately 22% of the total expenditure for public transit in the region (see Section 7.5.3).

In 1977 FF 7.8 billion ($1.86 billion) was spent on public transit operation costs in the Paris region. Of that amount 33% ($614 million) was derived from the farebox, 24% ($446 million) from the national government, 26% ($484 million) from employers, 11% ($205 million) from the departments and 6% ($112 million) from other sources. A total of FF 2.4 billion ($570 million) was spent on capital investment.

In real terms national government funding for urban roads for the entire country has been decreasing while that for public transit has been increasing. In 1975 22% of the urban transportation budget was for public transport. Currently in the Paris region almost three times as much national government money is spent on public transit as on roads. The Ile-de-France Regional Government spends twice as much money on public transit as it does on roads. New rail extensions are financed 30% by the national government, 30% by the regional government and 40% by the operating authority. The operator's share is derived from public loans or the employers tax.

7.2.6 Fare Level Determination

The fare level is determined by the national government in the following manner.

The RATP and the SNCF (suburban division) submit budgets based on their planned operations and capital investments to the STP for approval. All planning has been performed by the two operating authorities and not by the STP. The STP either approves the budgets or returns them for revision. Once they are approved they are passed on to the Ministries of Transport and Finance who make the final decision.

Based on the RATP budget the Ministries then decide the fare the RATP is to charge for a Metro ride. In order to meet current operating expenses the cost of a single Metro ticket should be set above F2 ($.50). Instead the government has chosen to set it at F1.25 (when purchased in sets of 10). This decision determines the fares for all other services within the region as well as the required subsidy, of which the national government pays 70%. The regional and local governments, who make up the remaining 30%, must comply with the decisions taken at the national level. Yet, even with this lack of representation the local governments are a bit reticent to complain since Paris is the only city in France receiving a national operating subsidy, and fares in the other cities are as much as double those in Paris.

7.3 Regional Plan

7.3.1 Background

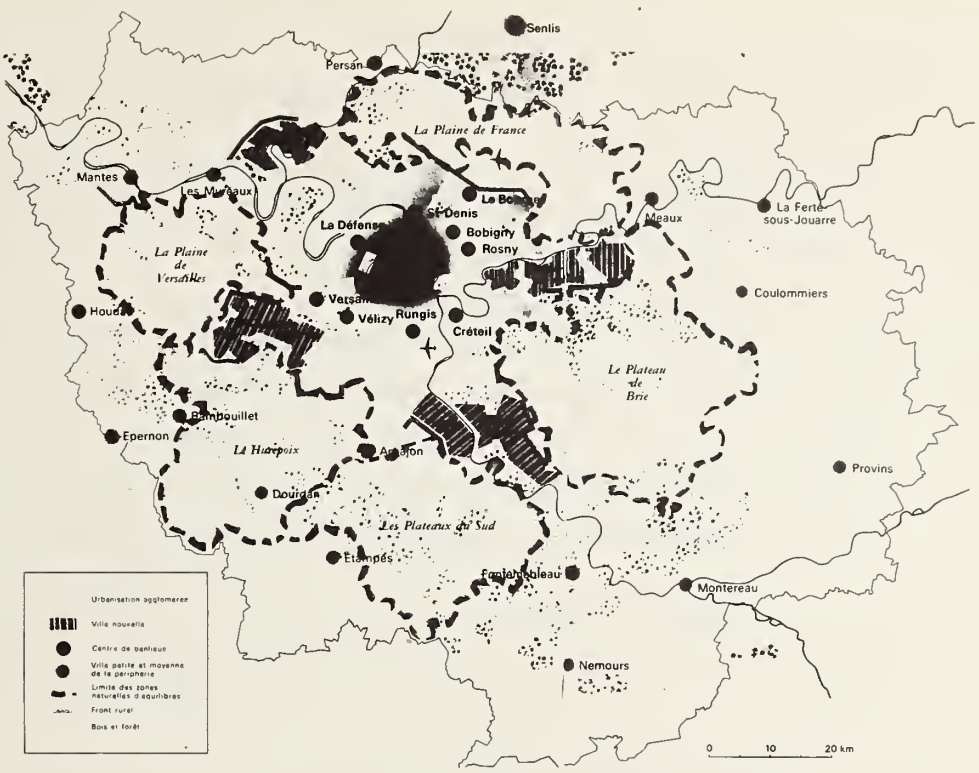
The region of the Ile-de-France experienced rapid growth after World War II, its population increasing from 6.6 million inhabitants in 1946 to 8.4 million in 1962. In the 1960's a population of 14 million was predicted by the year 2000.

Along with this population growth had been the gradual decline of population within Paris itself and the conversion of apartments into offices, the creation of badly planned, poorly built and under-equipped suburbs, and the corresponding loss of forest and farm land. While the city's population declined from 2,960,000 in 1954 to 2,290,000 in 1975, the inner suburbs grew from 2,750,000 to 3,980,000 and the outer suburbs from 1,710,000 to 3,580,000 during the same period.

Public transportation was in decline, freeways had been built around and to the edge of Paris, changes such as one-way streets and underpasses were made to the road network within Paris, and underground parking garages were built all to accommodate (and encourage) the rapidly growing car population.

7.3.2 Elements of the Plan

In an attempt to put an end to this chaotic development the Institute of Development and Town Planning of the Ile-de-France (IAURIF) was charged with creating the first comprehensive plan for the Paris region. Based on growth predictions that never materialized (population in the Ile-de-France is currently growing at a rate of .9% per year), the 1965 plan was revised in 1975 and the Regional Council would like to revise it again due to lack of population growth, financial constraints, and an increased emphasis on the environment and the quality of life.



Paris Region Master Plan

Right Bank Expressway

Preserving Historic Facades and Apartment Construction in Beaubourg Quarter

Several major themes underlie the plan:

- the creation of five new urban centers called new towns beyond the existing suburbs of Paris (10 - 35 km or 6-22 miles from Paris)

- the rebuilding and strengthening of 9 existing surburban centers with the aim of ameliorating the living conditions through the construction of new housing, the provision of new employment opportunities and the creation of other services such as universities and shopping facilities

- the controlled development of other small and medium sized towns surrounding Paris in order to contain urban sprawl

- the channelling of urban growth along preferred arcs of development and the safeguarding of large open spaces between these corridors

- the coordination of the development and functioning of the entire region including a better balance between place of employment and domicile.

7.3.3 Transportation's Role

Transportation is seen as a major tool for achieving the land use objectives set out in the plan, and the most appropriate infrastructure, route networks and balance of modes has been sought. The regional plan recommends the establishment of a transportation system with several elements. To assure the development of the new towns, efficient and rapid rail and highway links between Paris and the new towns have been provided. A circular freeway (A87) is being built to facilitate the interconnection of the new towns and the major centers of reconstruction, employment and services. Transportation in the central area including Paris and the inner suburbs is being improved by favoring

public transit within the central area through an extension of the Metro and RER, the modernization of the existing lines and of the rolling stock, the increase in bus frequency and the extension of the reserved bus lane network. In addition, the use of the automobile is to be discouraged through the strict limitation of long term parking (commuters as well as residents) and a ban on freeway construction within the boundaries of the city of Paris. A circular autoroute (A86), 6 km (4 miles) outside the Péripherique, is being constructed to connect the inner suburbs with the Metro extensions. Park and ride facilities are being provided.

7.3.4 New Towns

The five new towns created on the Ile-de-France - Evry (Essonne), Saint-Quentin-en-Yveslines, Marne-la-Vallée (Seine-et-Marne), Cergy-Pontoise (Val-d'Oise) and Melun-Sénart (Seine-et-Marne) have as their objectives:

- to put an end to the disordered suburban development and sprawl;
- to obtain a better balance between jobs and residential location in order to reduce journey to work distances;
- to offer the greatest possible choice in private and apartment dwellings;
- to create true urban centers with all the necessary activities: shopping centers, entertainment, public transport, etc.;
- to develop a modern urban setting and quality environment; and
- to offer possibilities for relaxation and sports.

The new towns have been solidly linked to Paris by autoroutes and high speed rail lines but have also been designed as autonomous communities. Between 1968 and 1975 a third of the new inhabitants in the region have decided to live in these new towns. However, since the large population growth predicted for the region never materialized, much of the infrastructure (e.g., parking facilities and commercial centers) has been overbuilt. In addition, there is an imbalance between residential and job opportunities, in part due to the construction of the La Défense office development west of Paris (see Section 7.7.3).

7.4 Public Transportation

7.4.1 Providers

The primary provider of public transportation in the Paris region is the state owned RATP (Régie Autonome des Transports Parisiens). It is responsible for bus, Metro and regional rapid rail (RER). The French National Railways (SNCF) operates a dense commuter network serving the city consisting of 36 lines on 884 km (550 miles) of track. The two systems are highly coordinated in both service and fare. Inter-urban bus service is provided by the APTR (Association Professionnelle des Transports Routiers), a group of 54 private bus companies.

There are 15,500 taxis operating in the Paris region, nearly all of them in Paris. There are relatively few para-transit services and no special transportation services for the elderly and handicapped. Public transit is not accessible to persons in wheelchairs.

7.4.2 RATP

7.4.2.1 Background

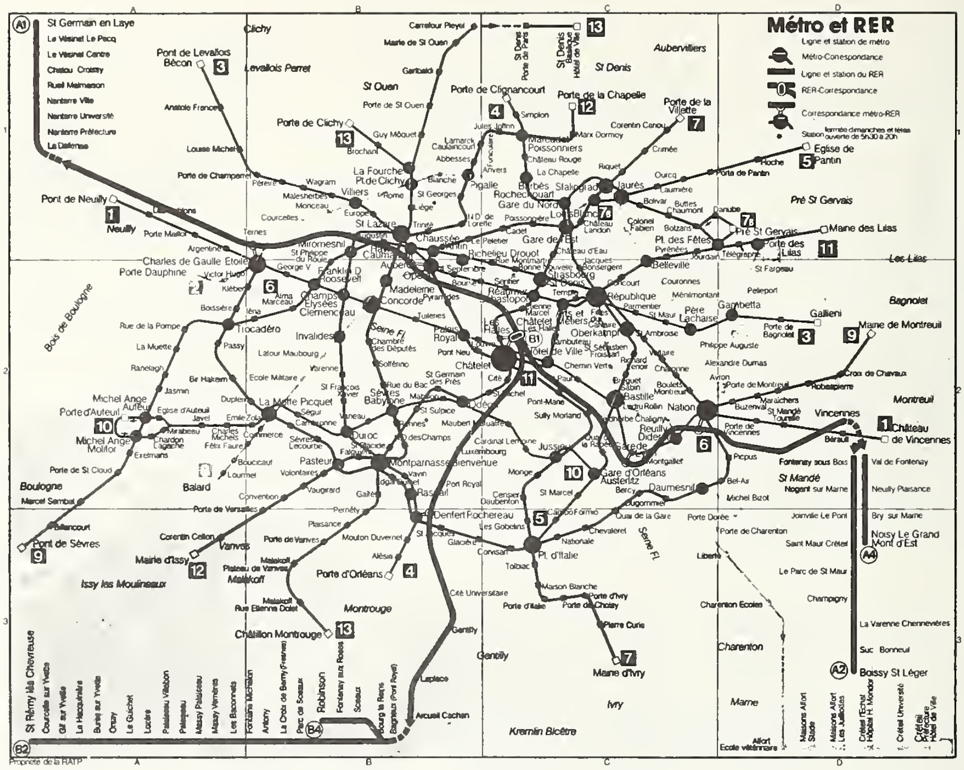
The RATP is an enormous undertaking, serving an urban area of 3,800 square kilometers (1,475 sq. miles) with 8 million inhabitants. It is responsible for coordinating, managing and financing nearly all public transportation within the area. It accounts for 80% of the trips made on public transit and each day carries over 7 million passengers. Employing 36,000 persons, in 1978 its budget was FF 5.6 billion ($1.3 million). Capital outlays alone amounted to FF 2.25 billion ($540 million).

Passenger revenues cover 37% of operating costs. Fifty years ago the farebox covered 70% of operating costs. Labor costs account for 67% of operating costs. The operating deficit is accounted for as follows: 27% national government, 8.2% city of Paris, 4.3% local municipalities, 14.5% employers tax and 9% miscellaneous.

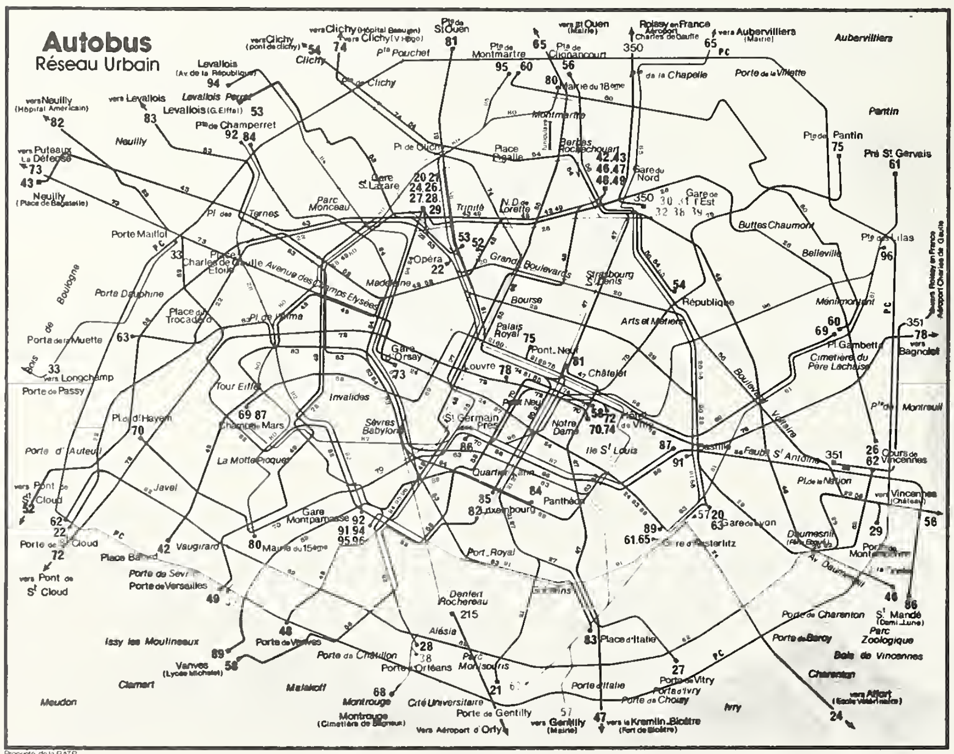
On the average, capital investments are derived from self financing (25%), subsidies from the State and the Ile-de-France region (25%) and public loans (50%). Sixty per cent of the financing for rail extensions is derived from the State and the Ile-de-France region. One-third of the capital investment is used to extend the networks, one-quarter for the renewal of the rolling stock and vehicles, and the rest for improving the operation, modernizing and maintenance of the facilities.

7.4.2.2 Modes

The most important element of the RATP's operations is the Paris Metro, serving the city of Paris and communities located in the near suburbs by means of its 15 urban lines. They form a very close-knit network totalling 183.4 km (113 miles) of which 156 km are within the capital limits. There are altogether



Paris Metro and RER



Paris Bus Network

some 353 stations (including 54 interchange stations) spaced about 500 meters (1,670 feet) apart. The Metro carries 4 million passengers per working day.

The Metro rolling stock has undergone accelerated updating, so that in 1978 modern rolling stock accounts for 77% of the total fleet. The latest order for 1,000 cars will complete the renewal by 1981. Recent technical improvements feature modernization of the operation and increased recourse to automation. Traffic over the entire system is centrally controlled, while on the main Metro lines the trains are under automatic train operation, including station stopping time. Train operation is accomplished by one employee. As an outcome of the modernization measures the traffic capacity of the system has risen by 30% (trains follow each other at 95 second intervals) while the quality of service has been improved by eliminating the major causes of inefficiency. This is reflected in a considerable rise in productivity. Tickets are magnetically encoded and verified automatically.

The RER, the charter of which is to service the medium and outer Paris suburbs, currently encompasses an east-west and a north-south line with a total length of 92 km (58 miles) of track, including 75 km (47 miles) in the surburbs and 59 stations. It carries 630,000 passengers per working day. The RER is being extended to form a direct connection between several major railroad stations, the two airports, the five new towns and many of the Metro lines. RER tickets, the prices of which vary by trip length, are vended by machine.

The RATP operates 4,000 buses over 200 routes covering 2,100 km (1,310 miles). The bus service forms a fine-mesh grid supplementing the looser grid of the Metro and RER. Each working day the buses carry 1,100,000 passengers in Paris and 1,420,000 in the suburban area.

The bus fleet is less than six years old on the average. In order to speed operations, buses are equipped with wide doors front and rear and tickets are self validated. The driver is rarely requested to sell a ticket since most travellers use the monthly fare card ("carte orange") or have purchased a set of 10 tickets in a Metro station at a discount.

The bus system employs several advanced operating methods. Forty-four routes in Paris and 72 routes in the suburbs are linked to central departure control stations which modify departure times as schedule perturbations occur along the route. All routes are linked by radiotelephone to their command stations. At present 25 terminal stations - i.e. 78 bus routes and 100 departure points - coordinate the Metro/bus interchanges during off-peak hours.

7.4.2.3 Planning

The RATP has an active planning function. In addition to developing a strategic 15 year plan, each year it updates a five-year plan covering the set of projects forming the future transportation in Paris. As well as being for internal RATP use, the plan assists the decision-making of the public authorities and the responsible officials by outlining an overall policy for public transportation and assessing the means required by the RATP to accomplish its mandate. It is used as input in updating the Ile-de-France Master Plan.

7.4.2.4 Promotion

The RATP conducts a major promotional and public relations program aimed at making its services more easily understood by the public and more enjoyable. Information bureaus have been installed in 23 Metro stations and more are planned. A telephone information service answers 1,200 calls a day. Maps of the area

indicating Metro stations, bus lines and major attractions are being placed in stations and at major intersections. Campaigns publicizing the reserved bus lanes, the radio bus control, the extension of the Metro to the suburbs, and other changes to the system have appeared in all forms of media. Prominent signs on the front and rear of buses have requested motorists to stay out of the reserved bus lanes.

Metro stations are being modernized and new ventilation systems are being installed.

In 1965 there were 87 escalators against 331 today, together with 5 moving walkways and 19 elevators. However, the system is not accessible to the seriously handicapped and will not be made so.

Stations have been personalized to express the character of the area. For example, the station at the Louvre has been redesigned in the style of the museum and works of art are on display on the quai level. All kinds of commercial activities, including boutiques, banks, and cafes, have been located in 91 Metro stations and in 20 RER stations.

The RATP has organized cultural, educational and social programs in its stations including concerts, painting exhibitions, poetry presentations and mini-circuses.

7.4.3 Adaptation to Changing Demand

The Paris travel market is constantly changing. While total trips are increasing, the number of trips with both origin and destination within Paris is slowly decreasing. Travel demand between Paris and the suburbs is growing and the number of suburb to suburb trips shows a strong growth potential.

In response to these changing travel patterns the present Metro lines are being extended outwards into the inner suburban ring and further rights-of-way are being reserved. Currently three lines are being extended to a total of 10 km (6 miles) at a cost of one billion francs ($240 million) and other extensions are being considered.

The RER is being built to serve trips between Paris and the outer suburban ring, particularly the five new towns and the two airports. The RER is directly connected to the SNCF suburban system and the Metro and bus routes have been reorganized to act as feeders to the stations. Most of the RER construction will be completed by 1983. Finally, orbital bus lines are contemplated to serve inter-suburban trips.

7.5 Transit Innovations

7.5.1 Introduction

There have been four major innovations in public transportation in Paris during the 1970's that have led to significant improvements in the system and have radically changed the demand for its services: the monthly or yearly card for all modes of public transportation within the region, the transportation payroll tax paid by employers, the system of reserved bus lanes, and the integration of the rail modes. The underlying policy, to maximize the use of public transit, has resulted in a system that offers a high level of service in terms of speed, reliability, comfort, and convenience at a fare level far below its actual cost.

7.5.2 Public Transportation Fare Card

Before 1975 tickets for the SNCF's commuter trains, the RATP's Metro, RER and buses and the APTR's buses had to be purchased separately. In 1975 a new fare structure was introduced

Paris' Orange Fare Card

Concentric Zone System for Orange Card

to integrate the various fare systems. Its objectives were to equilize fares for equivalent journey lengths, to reduce the cost for long distance trips, and to obtain a system-wide fare card so that several modes could be used successively with the same ticket. The result was the "carte orange" (orange card), which allows the holder unlimited travel on all modes, for one month or one year. The card contains a photograph of the holder who each month or year purchases a ticket encoded with a magnetic stripe that operates the computer-controlled turnstyle in the rail stations and indicates to the bus driver its period of validity.

The Parisian transport region has been divided into five concentric geographic zones. There is a unique price for travel within the interior of each zone. The cost of the card is a function of the number of zones crossed by the traveller and is valid for all means of public transportation crossing those zones. Cards are available for both first and second class travel.

The monthly price for a second class orange card valid in the city of Paris plus a ring 2 km (1.3 miles) around it is 57 FF ($13.50). This is equivalent to 45 Metro rides including free transfer to other Metro lines or 22-45 bus rides with no transfer privileges. Thus, the price of the carte orange has been set quite low. The first class price is double that of the second class.

The carte orange has been a major success in many ways. The predicted level of sales of 600,000 per month was immediately passed and is today on the order of 1,350,000, representing 39% of all Metro trips, 44% of RER trips, and 61% of bus trips within Paris. A citizen's survey confirmed the success with 91% indicating it to be a good idea. The orange card has resulted in a large increase in the perceived as well as real level of service to transit riders. People indicate that it has simplified

their travel, that their access to different areas of the city has been greatly improved, and that for the entire month or year they are travelling free of charge (a feeling similar to that of the auto user who has just filled up his gasoline tank).

One of the most important results of the orange card is that it encourages a more efficient use of the transport system since price barriers to intermodal transfer have been removed. This is best illustrated by the fact that bus trips increased by 36% soon after the card's introduction. Previously the bus, which gives a slower and less reliable level of service (though a more picturesque ride) had been overpriced vis-à-vis the Metro. Of the increase in bus trips 38% were former Metro trips, 30% pedestrian trips and 14% auto trips. An average of 70,000 auto trips per day shifted to public transport.

7.5.3 Payroll Tax

The payroll tax ("versement transports") extends the financial responsibility for public transport to employers. It consists of a 2% tax on gross salaries paid by firms with nine or more employees within the Paris region. The new towns have been excluded in order to encourage employment growth.

The revenue from this levy totals almost FF 2.4 billion ($570 million), approximately 22% of the total expenditure for public transit in the Paris region. The money is used both to cover operating deficits and to purchase new equipment.

The sharing of the revenues among the various public transit modes provides for flexibility in the allocation of financial resources. Since the tax is collected by the already existing Social Security Administration, only small administrative costs have been involved. Distribution is accomplished through the Parisian Transport Syndicate (STP).

7.5.4 Reserved Bus Lanes

Between 1952 and 1972 the RATP bus system lost 60% of its patronage despite the maintenance of a constant number of vehicle-miles. About 40% of the loss in clientele was attributed to a degradation in level of service, 35% to increased fares and 25% to socio-demographic changes.

During this period buses were afforded no preferential treatment and as the automobile traffic grew, both speed and reliability decreased. To maintain service levels the fleet of vehicles had to be increased. The introduction of one-way streets in the 1960's complicated the route structure. In 1967 the creation of a single Metro-bus ticket increased the cost of short bus trips by 225%.

By contrast, the 1970's have seen a radical improvement in bus services. A reserved lane program was implemented in 1973 and by 1977 there was a total of 95 kilometers (60 miles) of reserved lanes in Paris and 53 kilometers (33 miles) in the suburbs. About 25% of these are contra-flow lanes. The policy was adopted to route buses on the same streets for the two directions of the route and to group several routes together on the same streets in order to justify the reserved lanes which are used by both buses and taxis).

The costs of the reserved lane network were low. All that was required was signing, striping and painting the surface of the contra-flow lanes. While many opportunities still exist in suburban areas within Paris nearly all possible reserved lanes have been implemented.

Seven principal bus lines ("lignes-pilotes") use these reserved lanes for two-thirds of their journey. The reserved lanes have led to an average speed increase of 5% for the lignes-

pilotes and a large increase in reliability. The increase in bus ridership on the lignes-pilotes before the introduction of the orange card was 18% per year. Including the effect of the orange card, bus trips doubled between 1972 and 1978, reaching 1,200,000 trips per day.

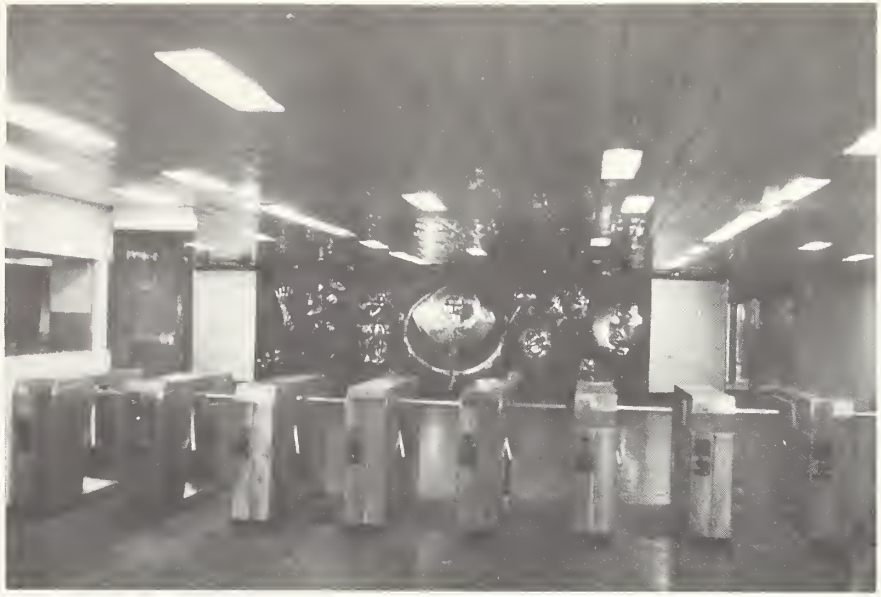
The reserved lanes have caused the removal of 10,000 parking spaces and have led to a decrease in access for some establishments. Accidents were a problem at first but are no longer regarded as such.

Buses are not afforded priority at intersections and this is seen as diminishing the effectiveness of the reserved bus lane system. During the past few years the reserved lanes were less and less respected by automobilists who drove and parked in them. As a result, bus speeds and reliability began declining. The RATP requested the following actions be taken: police surveillance of the reserved lanes, improved signing, widening of reserved lanes to 3.5 meters (11.6 feet), extension of reserved lanes to the intersection, raised barriers to separate the lanes and signal priority at intersections.

Following a month long publicity campaign in the media and the placement of prominant red signs on the fronts and backs of buses requesting motorists to obey the reserved lanes, the police began enforcing the restrictions. The fine for driving in a reserved lane was set at FF 120 ($29) and that for parking in one at FF 250 ($60).

7.5.5 Interconnection of SNCF and RATP Rail Networks

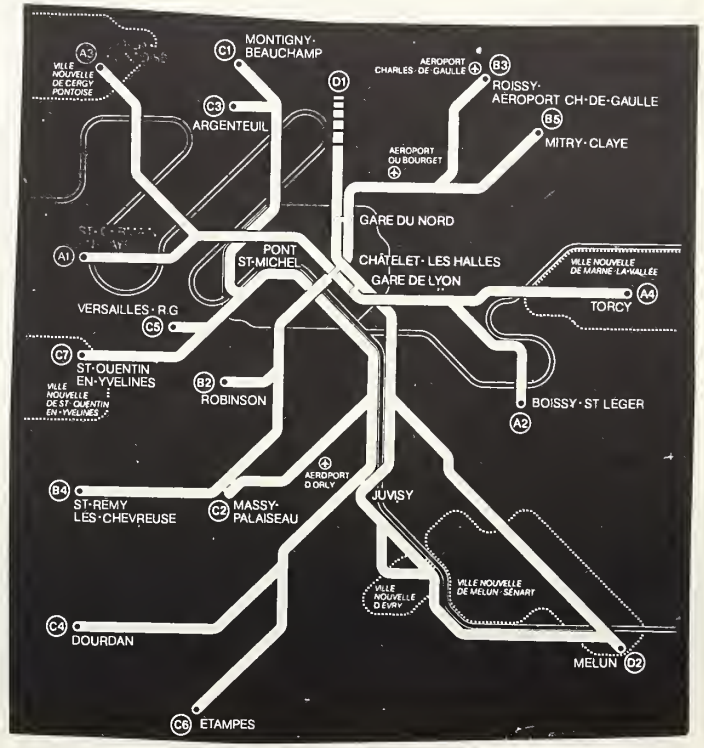
Historically the RATP has provided Metro service within Paris while the SNCF has provided commuter rail service from the Paris suburbs. With the idea in mind of maintaining its population, the city of Paris in 1880 decided to construct an



Computerized Turnstyles

Ticket Machines

Direct Connection to Department Store



Proposed Network

Paris' RER

urban Metro with a track gauge smaller than that of the standard railroad and to extend it only as far as the city's boundary. While the Metro and bus routes served the rail stations, time consuming transfers were required.

With the change in trip patterns and the increased importance of the Paris suburban population, it was decided to improve the connection of the RATP and SNCF rail systems. The result has been the interconnection of the three RER lines and the SNCF lines currently terminating at the Gare du Nord (North Station) and the Gare du Lyon (Lyon Station). When this operation is completed in 1985-1990 there will be one unified regional express service crossing Paris on three axis. This will include direct lines between the two airports and the five new towns passing through the center of Paris with several Metro transfer points. It is estimated that 2,700,000 inhabitants will be able to use the regional system. The cost in 1975 was placed at FF 2 billion ($480 million).

7.6 Pedestrian Areas

Paris has two major pedestrian areas. A three block by four block section of the Latin Quarter traversed by narrow winding streets and surrounded by major boulevards was closed to traffic several years ago. The area is filled with cinemas, small restaurants, cafes, hotels and apartments and is one of the most popular areas of the city, particularly among the younger residents. The huge crowds of people at all hours of the day and night had made this a "de facto" pedestrian zone even before it was officially designated as such. The distinction between sidewalk and road was removed and the surface covered in brick. Narrow, pedestrian clogged streets in other areas of the Latin Quarter also function as pedestrian zones although parking and traffic is permitted.

The second major pedestrian zone is in the Beaubourg section surrounding the new Pompidou Cultural Center. As with the other pedestrian precinct, this four block by six block section is characterized by narrow, pedestrian filled streets containing restaurants, cafes, art galleries, and apartments. It, too, is surrounded on four sides by major boulevards.

There are plans to extend the Beaubourg pedestrian area to the Place des Vosges in the Marais (a major restoration area filled with elegant apartments and art galleries) to the east and through Les Halles to Palais-Royal to the west, creating an urban pedestrian promenade 2.5 km (1.6 miles) in length, a veritable outdoor architectural museum of the past four centuries.

An unsuccessful, but very instructive attempt in pedestrianization occurred during the winter of 1978-1979. The Mayor of Paris instituted a two month experiment on four blocks of the eight block long Rue de Passy, and on two side streets. Rue de Passy is an elegant shopping street with narrow crowded sidewalks. One of the side streets is a major market street where pedestrians do constant battle with the automobile in the narrow right-of-way. Seemingly overnight large wooden planters containing trees and flowers as well as fountains and lights were erected in the street. Parking was prohibited and only persons living on the streets, taxis, delivery vehicles (before 1 p.m.) and buses were permitted. Parking was accommodated in an underground garage at the edge of the area that had recently been opened.

From the start the experiment was embroiled in a huge controversy. While inhabitants along the pedestrianized streets enjoyed their new-found peace and quiet, other area residents complained that they were unable to leave or enter the vicinity without being caught in a terrible traffic jam. Many merchants reacted violently, expressing the belief that their clients drove directly to their doors and that pedestrians never purchased

Latin Quarter Pedestrianization

Passy Pedestrianization Experiment

anything. These attitudes are directly counter to the experience with other pedestrian areas in France, Europe and the United States and usually change after several months. As a reaction to the negative sentiment a pro-pedestrian group was established which circulated petitions along the street.

Besides not being endorsed by the local merchants the experiment lacked firm political support: one local councillor was vehemently for pedestrianization and another dead set against it. The scheme had been poorly designed since the Rue de Passy provides a direct link into the center of Paris and "convenient" alternate routes were not available. An important street in the area had been closed due to a gas explosion, further complicating the circulation system.

Finally, the question was posed whether the new 350 space underground parking garage which was seriously underused was created so that the area could be pedestrianized or was on-street parking prohibited in an attempt to fill the garage.

After two months a survey of merchants and inhabitants showed mixed results and the project, which cost FF 500,000 ($120,000) was abandoned.

In summary, the experiment failed because several of the very basics were missing: a carefully designed plan, a firm political base of support, merchant support, adequate bypass routes, and a long enough period of experimentation for the merchants to realize financial benefit.

In addition to pedestrian precincts, Paris has several large public gardens and traffic-free squares. Numerous street markets are set up throughout the week and on these days the streets are closed to all but essential traffic. A plan to

build an expressway along the left bank of the Seine has been abandoned and the rehabilitation of the central portion of the quai is being considered. The Mayor is firmly behind all pedestrianization projects.

7.7 Joint Development

7.7.1 Introduction

In addition to the development of the five new towns in the Ile-de-France, two joint development projects with major transportation components are currently underway - Les Halles situated in the center of Paris and La Défense, just to the west of the city. Both projects represent enormous undertakings and strive for a mixed-use development firmly tied to and dependent upon a rapid and reliable public transportation system. Completely different in character, Les Halles and La Defense are experiencing serious growing pains that keep them constantly in the news and on the minds of the citizens.

7.7.2 Les Halles

It was ten years ago that the huge distribution market, Les Halles, was moved from the center of Paris to a new location outside the city. What followed has been one of the major public works and joint development projects in the history of the city of Paris.

The development has been coordinated by a semi-public corporation, SEMAH (Société Anonyme d'Economie Mixte d'Aménagement) created in 1969. SEMAH's role is to relocate and reimburse persons displaced by the redevelopment, to manage and construct the infrastructure (roads, pedestrian facilities) and to coordinate the entire development. Its board of directors consists of 6 members appointed by the city, 5 by the national government and one by the National Savings Fund. Fifty-one per cent of the financing is

Les Halles

La Defense

from the city, 25% from the State and the rest from the National Savings Fund, national banks, insurance associations and other groups.

Following the dismantling of the market, two large holes were dug on the 12 acre site. The first was filled with the world's largest underground commuter rail-Metro station, Châtelet-Les Halles, principal transfer point for the two RER lines and eight lines of the Metro. While the engineering problems for this project were formidable, the station was built on schedule and has successfully filled its expectations in the Parisian public transit system. The commercial forum, a glass enclosed complex of boutiques and pedestrian walkways above the station and just below ground level will be completed in the summer of 1979. However, all above ground construction was halted in the fall of 1978 by the Mayor who disagreed with the monumental style of architecture that had been adopted for some of the buildings. The area already contains two magnificent structures, the Saint-Eustache Church and the Commodity Exchange, and the Mayor pointed out that the "imitation Grecian-Buddhist" buildings that had been planned would undermine them. The second hole remains empty except for a deep puddle of water.

In February 1979 the Mayor announced his new plan for Les Halles and declared that the project would be completed in 1983. The development will include two apartment buildings in "simple and good taste", a 300-room hotel, and an office building. The second hole will be filled with a swimming pool, a gym, an aquarium and other public uses. The 6 hectare (15 acre) surface will be converted to a garden. It is contemplated putting Boulevard Sebastopol, the major street separating Les Halles from the Beaubourg pedestrian area, underground to provide direct pedestrian access.

Following a lengthy debate dedicated to architectural and financial concerns, the Paris Council adopted the plan at the end of March. The controversy, however, is not yet over. The Society of Architecture has launched a contest to develop a counter-plan for Les Halles, the winner of which will be decided in November.

7.7.3 La Défense

La Défense is a major urban development area three kilometers (2 miles) west of Paris. Previously this 2,000 acre site consisted of small factories, poorly built houses and slums. The suburbs adjacent to La Défense are pleasant residential neighborhoods populated by commuters who enter Paris via the several railroad lines terminating at the St. Lazare railroad station in central Paris.

In the 1950's office space in Paris was in short supply and an enormous demand for the near future was predicted. One large office building (Tour Montparnasse) was constructed within the Paris boundaries, but strong citizen reaction precluded major construction of office towers within the city on aesthetic and historical grounds. Due to the demand for office space large numbers of apartments within the center of Paris were being converted into offices and certain sections of the city were becoming deserted at night.

In order to arrest this trend the Regional Master Plan designated other areas outside the Paris boundaries for office development. La Défense was one of these. It was chosen to be a major activity center for several reasons: the existence of a good suburban railway system between La Défense and Paris and between La Défense and the residential western suburbs; the

proposed construction of an additional line of the RER to cross Paris from east to west; and the good highway system already serving the region and the ability to expand and improve it.

The authority in charge of developing La Défense, l'Etablissement Public pour L'Aménagement de la Défense (EPAD) was created in 1958. It is a public agency administered by a board of directors consisting of nine members representing the local communities and public authorities and nine members representing the national government. Among these nine members are representatives of the Ministry of Housing and Urban Development, the Ministry of Finance, the Ministry of Transport and the Ministry of Culture (which is in charge of architectural questions).

EPAD acquires and clears the ground and relocates the inhabitants. As far as construction is concerned, EPAD is responsible for the whole infrastructure including the access roads, the tunnels, the parking lots, the pedestrian deck, and the RER station. Private promoters are concerned with the construction of the office towers and apartment buildings according to the master plan designed by EPAD and which EPAD will modify slightly to accommodate the promoter's demands.

The money for the La Défense development was obtained through a series of eight-year loans from and guaranteed by the French Government at rates lower than the prevailing free market interest rate. These loans are being paid back from the revenues being produced by the development.

The development is split into two geographical areas. The eastern part (400 acres) contains the main urban activity center. The western part (1,600 acres) is being developed at lower density and contains the county prefecture, a university, offices,

apartments and some light industry. The rest of this section describes the urban activity center, which is the area that will be visited.

The urban activity center was planned as a traffic free environment containing all essential center city activities: office jobs for 100,000 people, a regional shopping center of approximately 1,200,000 sq. ft., neighborhood shopping facilities, apartments for 20,000 people, and four hotels with a total of 3,000 rooms. The office towers vary from 25 to 45 storeys, and apartment buildings from 5 to 30 storeys, all of them emerging from a pedestrian deck separated from the hidden underground parking levels, roads and railway tunnels.

The transport facilities for this area are of three types: roads and parking garages; public transport, including a major interchange station; and pedestrian areas segregated from the other circulation systems. The road system includes a one-way circular road surrounding the area and an underground distribution network. Approximately 32,000 underground parking spaces are provided.

The public transport interchange facility is also located below ground. This allows for the direct interchange for passengers between the suburban rail system, the RER (with a capacity of 50 thousand passengers per hour in each direction) and the local bus system (20 routes). The complex has direct corridor and escalator connections to the three stations and is connected by escalators to the pedestrian area and directly into an exhibition hall and a future regional shopping center. A new railway station was built for the suburban railway system serving two busy lines from Paris to the western suburbs. There are plans to extend another line, which serves the south-west part of the Paris region, to La Défense. The new RER station also serves as a

terminal for some of the local and suburban bus lines. There are plans to extend one of the principal Paris Metro lines into La Défense.

The pedestrian area consists of a traffic-free precinct from which it is possible to gain direct access to all the buildings. The area extends approximately 3/4 of a mile along the axis of the development.

While it has relieved the demand for office space within Paris (there is currently a law prohibiting the conversion of apartments into offices), the construction of La Défense has resulted in many serious problems for EPAD and the region. In an attempt to meet EPAD's financial obligations which were much greater than had been expected, the initial program of office construction (800,000 sq. meters or 9 million sq. ft.) was doubled in 1972.

However, the growth projected in the 1950's has not occurred, and the expected tenants have not materialized: the new modern art museum was built in the Beaubourg section of Paris, the National Ministry of Education refused to locate there and two large department stores have postponed their openings in the commercial center from 1977 to 1982 due to project construction delays.

Parisians are reticent to give up their jobs in Paris and work in the cold and isolated La Défense environment. For example, a plan to locate the Ministry of the Environment at La Défense was met with strong, but unsuccessful, protest by personnel who described it as a windswept concrete desert dominated by office towers, the dream of technocrats and financiers that has turned into a nightmare for those who live and work there. The huge

number of offices constructed in one place has created a serious imbalance of job and residential location in the Ile-de-France, particularly since several new towns have been constructed on the opposite side of the region. In an attempt to ameliorate the situation the French government has decided to reduce the amount of office space to be built to 1,200,000 sq. meters (13.3 million sq.ft.) which will be sufficient to make La Défense financially viable but still permit offices to be built elsewhere to re-equilibrate the city toward the east. EPAD is currently looking hard for tenants to occupy the 350,000 sq. meters (3.9 million sq. ft.) to be constructed during the next five years.

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8. MUNICH

8.0 Summary

	Population	Area	Employment	Motorization
City	1.4 million	120 sq. miles	730 thousand	1.4 million cars
Region	2.6 million	1,000 sq. miles	1 million	2.5 persons/car

Munich is the capital of the German State of Bavaria and is a major industrial and tourist center. The local government includes an elected City Council and Lord Mayor and two additional mayors chosen by the Council. Munich's Municipal Transport system, a division of the Public Works and Utility Department, operates the U-Bahn (metro), LRV's and regular and articulated buses. The German Federated Railroads operates an extensive regional commuter rail network (S-Bahn).

The Munich Joint Transportation Agency (MVV), owned equally by the City and the German Federated Railroads and with board members from the City, the Railroads, and the Bavarian and federal Ministries of Transportation and Finance, is responsible for all public transportation in the region. Due to its broad political representation and the powers invested in it, the MVV has achieved a high level of coordination among modes. It has reorganized schedules so as to minimize transfer time and improve the level of service. It has developed a unified fare structure. A weekly, monthly, or yearly fare card may be purchased for travel on all modes within the entire region or a subset of the region chosen by the passenger. The MVV redistributes fare revenue to the operators according to a pre-arranged formula.

The MVV is responsible for all transportation planning and investment policy. It also conducts extensive and innovative marketing campaigns and develops special weekend travel recreational packages.

Munich represents an excellent example of the complimentarity of modes. The extensive LRV system has served as a pre-metro phase and has helped create densities sufficient to justify the U-Bahn. As the U-Bahn is expanded, parallel LRV routes are abandoned and bus service is rerouted to provide a feeder function. Articulated buses are used on lines where headways are small and demand warrants the additional capacity and as collectors at rail terminals.

The S-Bahn lines have been connected by a tunnel passing through the center of the city, and there are direct transfer points between the S-Bahn and U-Bahn. Convenient transfer facilities between rail and bus have also been constructed. Several S-Bahn and U-Bahn stations exhibit excellent examples of mixed use development containing shops and direct connections to above ground shopping facilities. The policy is to make these stations as active as possible.

The public transportation system has not been made accessible to the seriously handicapped. H & E transportation is provided by welfare organizations and is subsidized by the city.

The center of Munich contains one of Europe's largest and most successful pedestrian areas. It was made possible by a partial ring road for diverted through traffic, the excellent public transit access and the strict central area parking policy that has considerably reduced parking supply. As a result of pedestrianization, the center of Munich rests secure as the dominant commercial area of the region and business has increased an estimated 40 per

cent. When the pedestrian area was extended, shop owners readily agreed to pay 50 percent of the costs for extending the pedestrianization to their streets. Planning for this project has resulted in a well developed citizens' participation process.

8.1 Introduction

Munich is the capital of the German State of Bavaria. Situated in a rural setting, without any competing city or urban area nearby, its population has grown from 480,000 in 1945 to 1.4 millions today. The Munich region has a population of 2.6 million persons. A recent trend of population decrease in the City of Munich was halted in 1977 while the region grew by 8,000 people, mostly due to in-migration from Northern Germany. Munich is a major industrial and cultural center and has the largest student population in Germany.

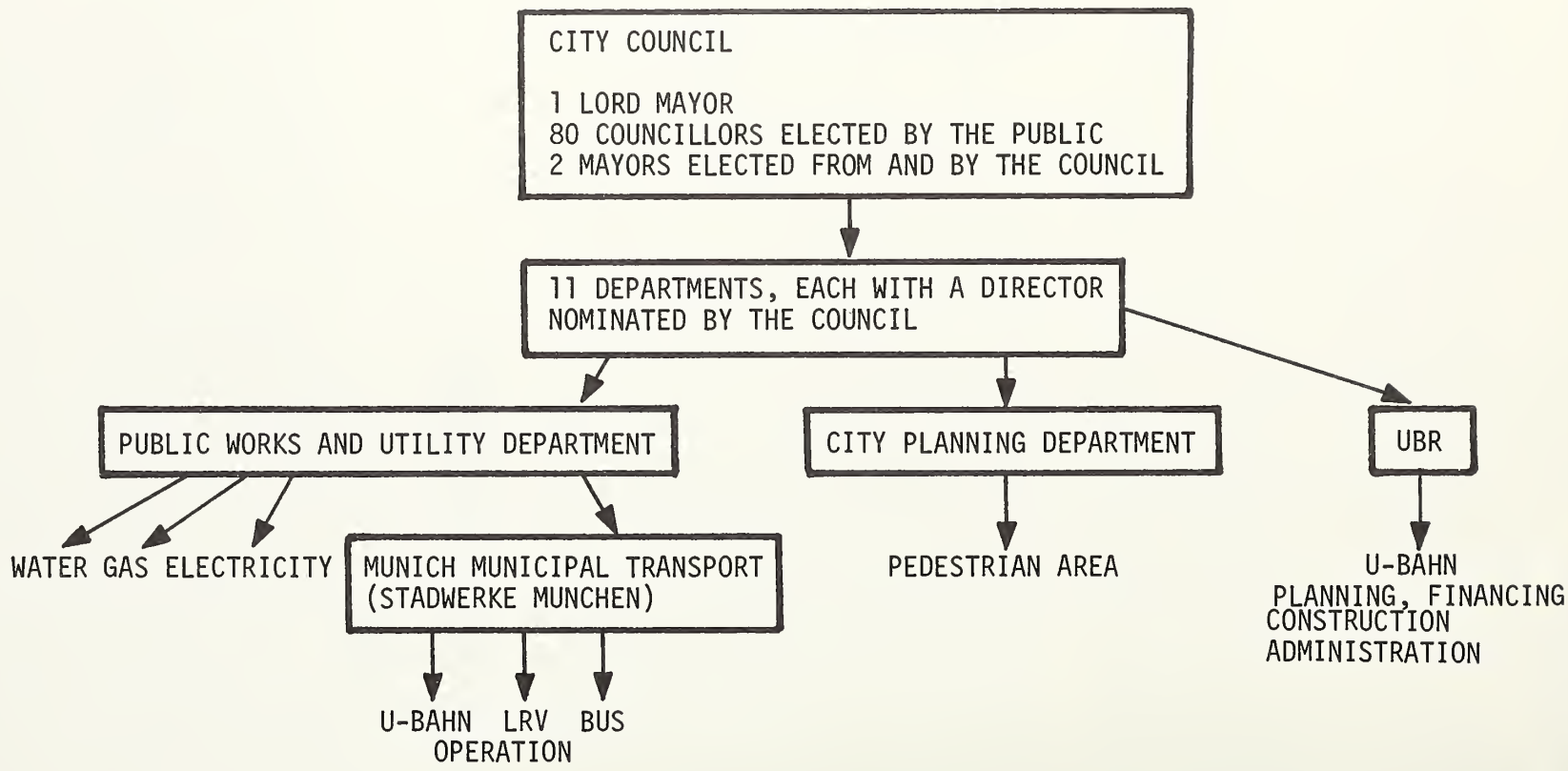
The Munich CBD is about one square mile and contains the old historical center and pedestrian area. Before World War II, 38,000 people lived in the center of Munich. Today the population is only 11,000, mainly students, young professionals and older persons. The dwelling units that were destroyed during the War were replaced by commercial structures, and no space is available to create more housing. Surrounding the CBD are older, low-income residential neighborhoods with large foreign worker populations. These are, in turn, followed by newer and wealthier suburban areas. People living as far as 35 miles away can commute to the city by the extensive rail network.

8.2 Institutional Arrangements

8.2.1 Local

The Munich City Government is composed of a publicly-elected City Council and Lord Mayor, two additional mayors elected by the Council, and eleven departments, each with a director nominated by the Council. The Lord Mayor is the head administrator of the City as well as the head of the City

MUNICH CITY GOVERNMENT



Council. The Council, which is composed of 80 members each elected for a six-year term, is the decision making body. Thirty-six district councils in the area surrounding Munich may make recommendations on matters affecting them.

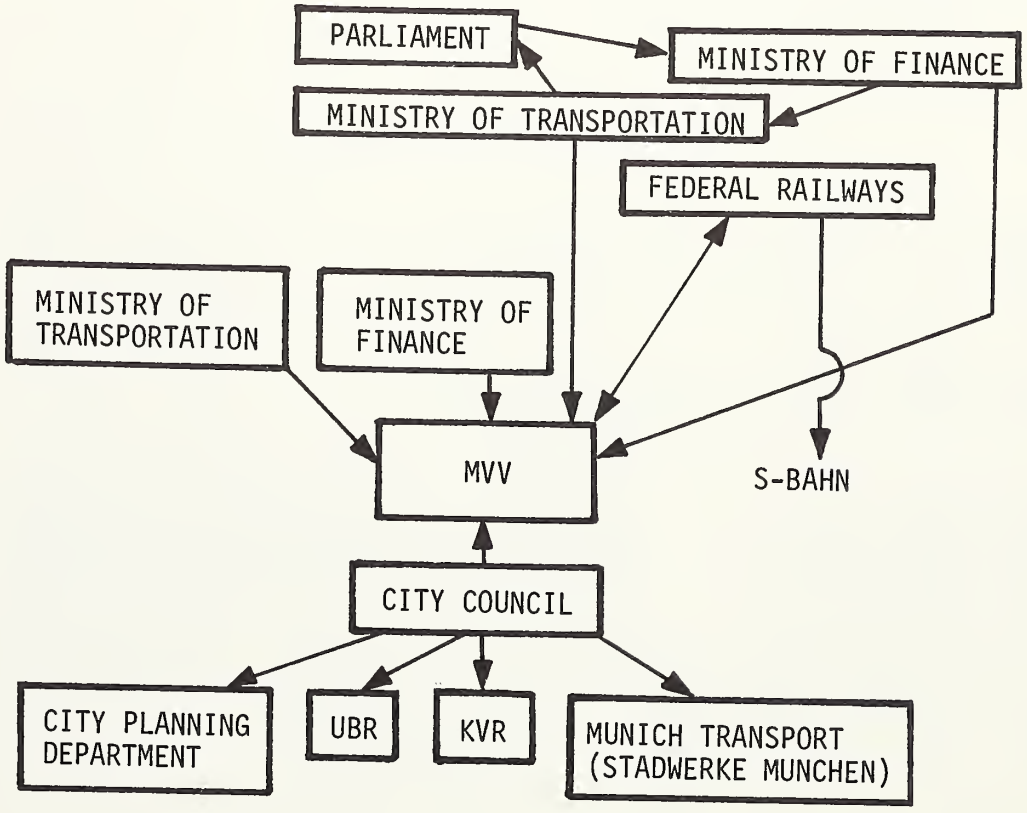
There are four departments that are of interest to the study tour:

1. the Public Works and Utility Department has as one of its divisions the Munich Municipal Transport System, the operator of the U-Bahn (metro), LRV's and buses;
2. the City Planning Department is responsible for the design of pedestrian areas, neighborhood improvements and general land use planning;
3. the U-Bahn Referat (UBR) was created in 1965 for the planning, financing, administration and construction of the U-Bahn; and
4. the Traffic Department (KVR) is responsible for traffic control and traffic management.

8.2.2 Regional

The authority responsible for public transportation in the Munich region is the Munich Joint Transportation Agency (MVV), a quasi-public company owned equally by the City and the German Federated Railroads. Management is appointed in equal numbers by both groups who in turn are responsible for hiring the staff (a total of 76 persons). Represented on its board are two members each from the City of Munich (the Lord Mayor and the head of the UBR), the Free State of Bavaria (Bavarian Ministries of Transportation and of Finance), the Federal Republic of Germany (Federal Ministries of Transportation and of Finance) and the German Federated Railways. Noticeably absent from this board of directors is a representative from the operator of Munich Transit, one of the agencies that must carry out the policies determined by the MVV.

MUNICH INSTITUTIONAL STRUCTURE



NATIONAL

BAVARIAN (STATE)

REGIONAL

LOCAL

The MVV's contract clearly specified its purpose and authority. It is in charge of all public transportation, but not road building. Specifically, it sets fares and schedules, planning and investment policy, revenue distribution, and advertising for all public transportation in the region (1,000 $mile^2$ zone of influence). The individual operating authorities may submit plans and proposals to the MVV, but all final plans are produced in conjunction with other relevant agencies. For example, planning for the U-Bahn is accomplished by the MVV, the UBR (U-Bahn Development Authority) and the City Planning Office. The individual authority, however, is responsible for its own operations.

8.2.3 State

At the state level, the Bavarian Ministries of Transportation and Finance are represented on the board of directors of the MVV. It is the Bavarian Government that collects both an income and a sales tax, parts of which go to the federal and local governments' general funds.

8.2.4 National

The national Ministries of Transportation and Finance are represented on the board of directors of the MVV. Along with other ministries, the Ministry of Transportation develops programs and requests funds from the Parliament which decides the partitioning. This decision is implemented through the Ministry of Finance.

8.3 Munich Transportation Plan

A transportation problem arose in Munich in the early 1960's due to the rapid increase in population, a shift in residence to the suburbs and a rapid increase in automobile use. In 1965, the City Council adopted a general transportation plan

which was implemented in 1972. It represents one of the most advanced experiments in reorganization and integration of the system of transportation in a major city. The plan's principal elements include:

- construction of a metro (U-Bahn)
- installation of a regional rapid transit system (S-Bahn) integrated within the existing Federal railway lines
- integration of all municipal and regional transport services (U-Bahn, S-Bahn, LRV and bus) in a coordinated system of operations (schedules, fares, transfer points), budgeting and publicity
- modernization of all rolling stock
- pedestrianization, traffic re-routing and control of parking in the central area
- traffic management.

8.4 Public Transportation in Munich

8.4.1 Modes

Public transportation is provided by suburban commuter rail (S-Bahn), metro (U-Bahn), LRV and bus. The corresponding route lengths are 257 miles (411 km), 11 miles (18 km), 70 miles (112 km) and 578 miles (925 km). The U-Bahn is being constructed at a rate of 2 miles (3 km) per year. As new segments are opened, redundant LRV segments are scrapped and LRV's and buses are reorganized to provide a feeder function. When the U-Bahn is completed in 1990, the last LRV line will be closed. The LRV lines can be thought of as a pre-metro phase and have helped create densities sufficient for justification of a U-Bahn.

Twenty-five percent of the bus fleet is articulated. These vehicles are used on lines where demand warrants and headways are already less than 5 minutes during peak periods and less than

8 minutes off-peak. They are also used as collectors at rail terminals where large amounts of travellers disembark at one time.

8.4.2 Operating Statistics

The current public transit modal share is 48% and this is expected to reach 58% when the U-Bahn is completed. Between 1973 and 1977 total one-way trips by transit (trips requiring a transfer are counted as one trip) have increased by 16.5%. Operating costs have increased by 24% while revenues have increased by 39%. Since 1972 there are 12% fewer cars on Munich streets although there has been a 14% increase in car ownership in the region. Air pollution has decreased by 25%, but this has been due to other changes in addition to transportation.

8.4.3 Schedule

In 1973, the MVV reorganized the schedules of the S-Bahn, U-Bahn, LRV's and buses in order to minimize transfer time and improve level of service.

8.4.4 Fare Structure

A unified fare structure was implemented by dividing the city into concentric zones. The fare is a function of the number of zones crossed. Tickets are available for single or multiple rides as well as for a specific length of time (5 days, 7 days, monthly, yearly) and for tourists. There are also cards at reduced rates for special users such as children and the elderly. The elderly are given a 70% discount, but are not permitted to use their cards during rush hours.

Almost all tickets are sold by machine or in stores (the store receives 3% of the purchase price). Only 5% of the tickets are sold by the bus or LRV operator. There is no ticket control in the stations. Inspectors make spot checks and the fine for

Munich MVV Region, S-Bahn and Existing U-Bahn

Proposed U-Bahn

non-payment is 40 DM ($20). The estimated loss of 2% is more than made up by the 12% savings in ticket collection costs.

8.4.5 Funding

The MVV receives all ticket receipts (on paper) and distributes them to the operators according to a pre-arranged formula based on the number of miles of service provided. The rate to the City for buses, LRV's and U-Bahn is higher than to the Railroad for the S-Bahn because the Federal Government, by law, covers deficits incurred by railroads while the City must pay the entire deficit of all other modes. S-Bahn costs are considerably higher than other modes due to system extensiveness - 35 miles into the sparsely populated country - and a relative lack of modernization. Determining an acceptable revenue sharing arrangement has been the major barrier to fare integration in the United States.

For all the MVV's services, the farebox covers an average of 50% of operating costs. The operating subsidy for the U-Bahn, LRV's and buses is 34% and is paid by the City of Munich out of general funds. That for the S-Bahn is 65% and is paid by the national government, also out of general funds. Capital investments, however, are paid for by a 7 pfennig tax on every litre of gasoline which raises 5 billion DM ($2.5 billion) per year. Fifty per cent of this goes for roads while the other half is used for public transportation.

There are eight counties surrounding Munich. Two of these have contracts with the MVV and support their City-provided transport services. The other six counties have only marginal service from the City but excellent S-Bahn service (which is subsidized by the Federal Government).

8.4.6 Marketing

The MVV conducts an extensive marketing campaign. Their primary instrument is a small magazine published every two months and distributed free of charge. It contains information about the system, special offerings, and articles related to transportation (some of which are critical). The MVV has developed several special offers. On weekends, the "Wandern" program has been instituted. The MVV has set up 100 km (60 miles) of walking and jogging paths in the country surrounding Munich. Trails are well marked and maps and booklets have been printed. This weekend package brings in 8 million DM ($4 million) per year in revenue. What is important is that not only does the MVV create publicity for taking the S-Bahn to the country, but it provides all the necessary information on how to get there and what to do when you arrive. The MVV implemented a train-cinema promotion where one ticket paid for a train ride into the city and entrance to a film. Another package, in conjunction with a ski equipment store, includes transportation to a ski resort on the German Federated Railroad. A rally on public transport was organized by the MVV. The Railroad rents bicycles at certain stations.

A market analysis is performed every two years by an independent research firm. In summary, 86% of the persons interviewed use public transportation more since the changes in fares and scheduling. People perceive their monthly or yearly fare card as providing trips at almost no marginal cost and taking transit is felt to be more convenient than before.

8.4.7 Public Participation in Public Transportation

As was explained earlier, the MVV includes representatives from the City of Munich, the Bavarian and National Governments and the Railroad. There are 44 local districts within the City of Munich each with a mini-parliament of 25 local

elected officials responsible for their small portion of the City. The MVV works with these groups on matters affecting their jurisdiction, and, if agreement cannot be reached, it is the Munich City Council that decides. In addition, there are 230 small communities in the MVV's area of jurisdiction, each with a mayor and village parliament, and the MVV works with them on pertinent matters. Finally, a citizens' initiative process (Munich Forum) exists where the MVV can be taken to Management Court at no expense to the citizen. An MVV spokesman indicated that this process is being abused and cited the blockage of a proposed LRV route by a group intent on preserving 30 trees.

8.4.8 Labor Relations

One amalgamated union represents all transit workers. Two representatives from management and two from the union deal with all labor issues. In the past 30 years there have been only two strikes by transit workers. The labor contracts include many labor saving arrangements: there is one operator on U-Bahn and LRV's (LRV's travel as linked pairs and all ticket validation is the responsibility of the passenger) and nearly all tickets are sold by machines at U-Bahn stations and LRV and bus stops. Labor saving agreements are reflected in pay scales. For example, when the number of operators on the LRV's was decreased from two to one, the driver's salary was increased approximately 10%. Labor costs represent 55% of Munich Transit's operating costs.

8.4.9 Handicapped and Elderly

Buses and LRV's have not been made accessible to the handicapped and elderly (H & E) through the use of ramps, lifts or kneeling capabilities. The only modification has been to remove the center handrail at the rear door to provide enough space for wheelchair entry. There are elevators in only the

principal U-Bahn stations. Others have escalators and some stations farther from the center have neither elevators nor escalators. It is planned to have elevators in all the stations of the third U-Bahn line, but this has yet to be agreed upon by the Federal and Bavarian Governments.

The International Metropolitan Railways Committee of the International Union of Public Transport reflects the policy of Munich Transport in the provision of service to the handicapped on the U-Bahn. Measures to assist the slightly handicapped and which are capable of being implemented at acceptable construction and operating costs, such as escalators, should be implemented. Individual measures for the severely handicapped, such as elevators, only serve to make a portion of the transit system accessible. It is necessary to consider whether making a system accessible does not introduce additional inconvenience and risk for the great majority of passengers as well as for the handicapped, for example a wheelchair blocking a heavily used corridor, or in the event of a breakdown requiring emergency evacuation.

The general feeling is that the costs would be prohibitive in making the S-Bahn, U-Bahn, buses and LRV's fully accessible and that it is preferable to provide alternative services such as subsidized taxis or specialized small vehicles. In Munich H & E transportation is provided by welfare organizations and is subsidized by the City.

8.4.10 U-Bahn (Metro)

8.4.10.1 Planning, Construction and Citizen Participation

Munich's first traffic plan (1963) called for the development of a rapid transit system as the only possible way of relieving the city's congestion problems. It was decided that

Maintaining Access During U-Bahn Construction

U-Bahn

Commercial Activity in an S-Bahn Station

this could best be accomplished through the creation of a separate city authority, the UBR. In 1965 a general transportation and land use plan was placed before the City Council for a vote. Details of the plan were publicized in the Munich papers and were made available to the public at the city's Public Works Department. Citizens' objections to the plan were accepted by the developers of the plan and any objections that could not be resolved were brought before the City Council. The Chamber of Commerce and other interest groups were also asked their opinion. As prescribed by the Federal Constitution, any unsatisfied objections could be taken to court, but this was not done.

Following the Council's decision to build the U-Bahn, the UBR began detailed route planning. One of the greatest problems was decrease in access to adjacent property during the construction phase and the loss in business revenues and property value. To address this problem the UBR took a series of steps: (i) all those concerned were given detailed construction plans including street closings, traffic reroutings, temporary walkways, etc.; (ii) objections were examined and, if valid, a solution was sought so that sufficient access could always be maintained; (iii) if financial damages were still likely to occur, the UBR made a lump sum payment to the injured party so that the enterprise could keep functioning, amounting to approximately one per cent of construction costs.

The first U-Bahn line (14.5 km = 9 miles) was opened in 1972 and connects the center of the city with the Olympic Park. The metro is now 18 km (11 miles) in length and another 18 km will be opened in 1980. The system is being expanded at a rate of 3 km (2 miles) per year and a total of 90 km (56 miles) is planned, all of it within the city boundaries. As new lines are opened, redundant LRV routes are closed and buses rerouted to provide feeder service.

8.4.10.2 Funding

The cost of the U-Bahn, including stations, has been between 20 million and 80 million DM/km ($16 million and $64 million/mile) with the higher figure occurring in the central city. The funding is 54% federal, 18% Bavarian Government, and 28% local. The Bavarian Government collects both an income and a sales tax, parts of which go to the federal and local governments' general funds. The Federal Government also levies a tax on gasoline specifically earmarked for U-Bahn construction and this makes up the major portion of the federal grant. In addition to the monies from the Bavarian Government, Munich collects a real estate tax.

In order to obtain Bavarian and Federal Government funding for U-Bahn construction a city must meet certain prerequisites, the primary being that passenger demand will justify its construction.

8.4.10.3 Security in U-Bahn Stations

Security in U-Bahn stations is seen to be enhanced by encouraging activity through the provision of shops on the mezzanine levels. A two-man security team patrols the 20 U-Bahn stations in the evening.

8.4.11 S-Bahn (Suburban Rail)

Before 1972 eight lines of the suburban railroad system terminated at the principal train station in the western portion of the CBD while the other five lines terminated at the east station. Travellers were forced to walk or transfer to bus or LRV to reach their final destination within the city. To provide a major improvement in access, a tunnel 2.6 miles (4.2 km) long was constructed between the two stations and the equipment on the lines standardized and renovated. Today S-Bahn trains from the suburbs run directly through the city, making several

stops along the way, and provide direct transfers to LRV's buses and the U-Bahn. The total route length of the S-Bahn network is 411 km (257 miles) and extends 35 miles into the suburbs.

8.4.12 S-Bahn and U-Bahn Station Location

S-Bahn and U-Bahn stations have been located where they can provide the best possible access for passengers arriving on foot or by bus. Often stations along S-Bahn routes, constructed 100 years ago, are no longer in the center of activity. The City has control over zoning and can decide where to relocate them. The MVV proposes the building of a new station which is subject to a public hearing. If there is a dispute, the Bavarian Government (the next highest level) makes a ruling. This decision can be contested by the courts, whose decision is final. There have been almost no disputes over station location.

All S-Bahn stations have small (nothing larger than 600 spaces) surface parking lots. Parking garages have not been constructed due to high costs and fear expressed by women users. Some of the outer U-Bahn stations also have surface lots. Currently 75,000 spaces exist and this will be increased to 110,000.

8.4.13 Joint and Mixed-Use Development in U-Bahn and S-Bahn Stations

Original plans did not call for the construction of stores in the U-Bahn and S-Bahn underground stations. However, rather than filling the unneeded space with earth on the mezzanine level, shops have been constructed in all stations. The major S-Bahn station at Karlsplatz contains a large shopping development below street level and Munchener Freiheit, a major U-Bahn and bus transfer point, contains a complex of underground stores.

Development is paid for with public monies and rents go into the general city fund. Direct connections to existing stores are provided at the owner's expense. Stores have been found to be desirable for both amenity and security reasons. The direct access is valued highly by the store. One department store claims that sales have risen 40% due to its underground connection.

No apartments or offices have been built by the City or coordinated through the City. A City official claims that large apartment buildings have not been built at U-Bahn stations due to the high costs of such structures (in part due to engineering considerations over U-Bahn rights-of-way) and that rents would be so high in these buildings that only the rich could afford them. One hotel and apartment complex is in the planning stage for a future U-Bahn station. The S-Bahn routes have attracted a denser development, freeing other suburban and country land for recreational purposes, but there has been no joint development policy.

8.4.14 S-Bahn and U-Bahn Effects on Land Use

The Munich region has been growing faster than the city, and this trend was most evident in the 1960's before the S-Bahn was established. The S-Bahn lines have attracted activity and are the hearts of development for housing, factories and offices. One City official stated that the S-Bahn has provided better transportation for those already in the outer suburbs as opposed to having encouraged more people to move there. In opposition, another official claimed that the S-Bahn has encouraged city sprawl.

The U-Bahn has had little effect on land use. It has merely replaced the LRV routes which had already helped create the development. In addition, the service area is completely built upon and the land market is very stable.

8.5. Central Area Pedestrianization

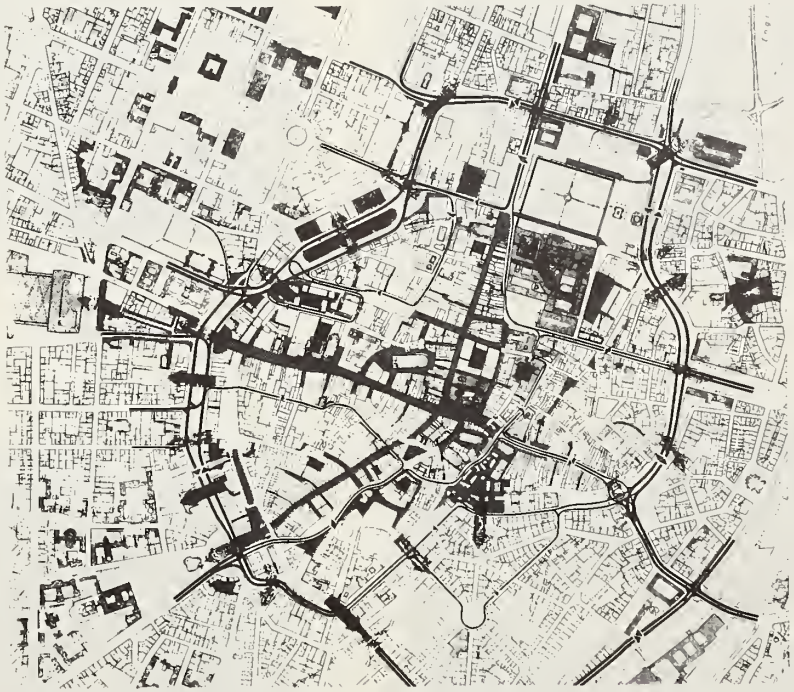
8.5.1 Planning Process, Implementation and Public Participation

The central pedestrian zone covers an area of approximately one square kilometer (.36 square mile). It, too, was a component of the 1963 master transportation and land use plan that stated that such an area could be constructed if excellent rapid transit access and a ring road for diverted traffic would be provided. The idea for a pedestrian precinct had been in the air for several years, being informally discussed by city planners, politicians, the press and the business community. It was the City Planning Department that put these ideas together as a portion of the master plan.

This period marked the beginning of the public participation process in Munich and, indeed, for all of Germany. The process began in an informal way with debates occurring between business groups, politicians, automobile interest groups and the like, the establishment of an ad hoc private citizens interest group, and numerous articles in the press. The City Council asked all interest groups to submit their official statements on the proposal for consideration, but was bound to none of these. In fact, there were no major disagreements with the master plan.

The next step towards pedestrianization was a research paper on the effects of pedestrianization which was submitted to the City Council. Citizens were given a chance to react to this through a series of hearings organized by a private citizens' group, letters to the Council and through the press.

It was when the City Planning Department began to prepare more detailed plans for the pedestrian area that the public participation process became more formalized (1968-1969). Nearly



MUNICH'S CENTAL CITY PEDESTRIAN AREA AND RING ROAD

Munich's Centra Area Pedestrianization

every month a committee of all interests involved - store and property owners, automobile groups, even street vendors - met with the city planners.

After the program had been developed and approved by the City Council, a competition was held for the actual design (type of pavement, street furniture, lighting, etc.) and a jury of architects, planners and politicians elected the top two proposals. The two firms were asked to work together to develop the final design, which was the recipient of the Reynold's Award in Architecture.

In addition to this careful planning process, S-Bahn construction had prohibited traffic on several principal streets in this area for several years, and drivers had become used to taking other routes. Therefore, there was no public outcry when pedestrianization occurred.

As required by the original master plan, pedestrianization was made possible, in part, by the transportation policy that assured excellent public transit access from as far away as 35 miles and the creation of a partial ring road around the area for through traffic. The original zone, nearly linear in form, has since been expanded into a grid and includes several walk-through arcades. However, a further extension of the main pedestrian axis from Karlsplatz to the train station (Bahnhofplatz) has been stalled for five years due to a highly vocal group of hotel owners along the route who fear that decreased auto and taxi access will cause their clients to go elsewhere. It appears that the public participation process has become too institutionalized and too highly developed, so that one minority interest group can now indefinitely stall a plan that everyone else agrees is a good idea.

8.5.2 Effect on Business

The pedestrian area is filled with people during the day. While the primary activity is daytime shopping, there is still considerable pedestrian activity in the area at night by U.S. standards, and the area is safe. Pedestrianization has led to a large increase in the area's retail sales with shoppers coming from as far away as 40 miles. It has proven to be a successful challenger to the suburban shopping centers. While information is difficult to obtain, one estimate puts the increase in sales at 40%. There appears to have been no negative effects on stores not on pedestrianized streets since the pedestrian area is not linear, but rather a grid and all streets are used by pedestrians.

The pedestrianization has resulted in a higher quality and specialization of stores. Department stores have increased their physical space as much as possible, reducing the number of small stores to the point where a proper balance no longer exists.

Current plans are to create several commercial sub-centers at major U-Bahn stations, but a City official suggests that these will not succeed because they are artificial and incomplete. Vibrant activity areas cannot be designed and implanted in a vacant area; rather they must evolve over time. This is best illustrated by the pedestrian area in the historic center which is filled with activity and is considerably more than just a shopping center, having attained its richness and diversity over the years.

8.5.3 Value Capture

The original pedestrian area from Marienplatz to Karlsplatz, which was paid for entirely by City funds, was a huge financial success for adjacent businesses. When the City decided to pedestrianize the Theatinerstrasse, store owners and renters were asked to contribute 50% of the costs of construction and told that if they did not provide the money, the pedes-

trianization would not take place. Recognizing the potential benefits, they all agreed. Operating costs for the entire pedestrian area are provided by the City.

8.5.4 Ring Road

The western portion of the ring road, a wide arterial with offices and commercial enterprises, existed before the pedestrianization scheme was implemented and no adverse effects have been encountered. The eastern portion of the ring road, however, was newly created, in part, by demolishing residences. This led to considerable damage to the social structure of the neighborhood through which the road passed. As a result, the southern portion of the ring road will not be built, However, due to other available routes and the effectiveness of public transit, the ring road is no longer seen as an important element in the plan.

8.5.5 Parking

The Munich parking policy is very strict. In the CBD (one square mile, including the pedestrian zone) no new parking spaces have been permitted since 1971. The number of parking spaces has been decreased from 17,000 to 12,000, primarily through the elimination of on-street spaces. On-street parking is limited to two hours and metered. Unfortunately, a federal law limits the permissible parking charge and higher rates cannot be set for further automobile restraint. Receipts of parking operators are down, and at least one operator would like to demolish his garage and construct stores.

Building codes require a certain number of spaces per building, but developers of new buildings in the CBD are permitted to construct only 10% of this required number. They pay to the City a sum equal to 7,500 DM ($3,750) for each space not constructed. The City then uses this money to construct parking spaces in other areas - park-and-ride lots at S-Bahn and U-Bahn stations and in residential areas on the fringe of the core where shortages exist. The average costs of these

spaces is 15,000 DM, twice what the CBD developer is required to pay. Only two parking lots have been created in residential areas due to the lack of adequate space.

8.6 Inner City Residential Areas

Inner city residential areas have become run-down and are in need of rehabilitation. This is where the large foreign worker population resides. The German residents have been moving to the suburbs. The rehabilitation of these neighborhoods is viewed as a necessary element in maintaining the vitality of the city, particularly the central commercial area. It is felt that the neighborhoods can be made more attractive by auto restraint, but not through large scale pedestrianization since this may make the area too attractive, forcing rents to rise and driving out the very middle class residents it was designed to keep.

The CBD parking fund has been earmarked, in part, to build parking garages in these neighborhoods, but so far only two have been built, due to the inability to find suitable space.

The Schwanthalerhöhe residential area has a parking permit program during the Oktoberfest to reserve parking spaces for residents. Programs in other areas have not been attempted because German law makes them illegal.

8.7 Traffic Management

The two important traffic management applications in Munich are the priorities given to the LRV's and the ring road around the pedestrian zone. A large portion of the LRV routes follow their own right of way. The Traffic Department considers this essential, particularly in the central city, to maintain reliable

schedules. In order to minimize delays at crossings, LRV's are given a special signal phase for left-hand turns. There is no signal preemption system.

The City set two prerequisites for construction of the large pedestrian area: an efficient transit system and a ring road to accommodate diverted trips. A portion of the ring road already existed and another portion was constructed. Traffic signals were carefully timed and coordinated to maximize potential flow along this route. However, the City's policy in general is to do everything possible to discourage trips to the central area by car (e.g. limiting parking, one-way street mazes and superior mass transit). As LRV lines are being removed, the freed street space is not being allocated to the automobile. Rather curb separated bicycle lanes and tree plantings are provided where possible.

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9. DELFT

9.0 Summary

Population	Area	Employment	Motorization
90,000	4.3 square miles	35,000	26,000 cars 3.5 persons/car

Delft is a small town in the western part of the Netherlands. Its dense commercial center is criss-crossed by narrow streets and canals and contains nearly all the area's shopping and entertainment facilities. The publicly elected City Council selects five aldermen and a deputy mayor. The mayor is chosen by the national government. Delft's aggressive and spirited Department of Public Works has been responsible for developing and implementing many innovative land use and transportation projects.

The national Ministry of Transport and Public Works sets national transportation policy and provides funding for transportation improvements. It provides funding in response to traffic circulation plans prepared by the cities. The Ministry has performed a mode comparison study indicating the desirability of LRV's over metros for cities of the size and density found in the Netherlands. It has been moving in the direction of a national fare card for all public transportation. While making transit accessible for those in wheelchairs is felt to be too costly, small changes are being encouraged to make service more convenient for the less seriously handicapped.

Of all the innovations that have occurred in Delft, the most well known and original is the woonerf. Woonerven are special

precincts, generally in residential areas, where motorized vehicles are permitted,but their power is greatly diminished by the physical design of the roadway. Bumps, curves, tree plantings, benches, etc. are placed in the way of the automobile, and vehicular traffic is slowed to a pace compatible with that of the pedestrian. A pedestrian ambiance is created, parking is limited and is often reserved for residents, and a public transit alternative is provided.

The center of Delft has many pedestrianized streets as well as a restrictive parking policy and a modified cell system. The area has been divided into four cells, and the boundaries can be crossed in only a few places in order to facilitate deliveries. A bus route through the area has been implemented with the buses being able to open a gate that serves as a portion of a cell boundary.

Public transportation in Delft is primarily by bus (there is one LRV line) and public policy has been to make it as efficient and convenient as possible. Monthly and weekly passes, routes passing within 1,000 feet of most houses, 15 minute headways, convenient transfer points and on-board two-way radios to facilitate transferring all contribute to an increased level of service. Bus efficiency has been improved by reserved bus lanes, queue jumps, bus-only streets, signal preemption and a real-time computerized signal control.

9.1 Introduction

Delft is a small town in the western part of the Netherlands situated equidistant between The Hague and Rotterdam. The dense commercial center, which dates back to the 8th century, covers about one square mile, is criss-crossed by narrow streets and canals, and contains nearly all the area's shopping and entertainment facilities. Since the end of World War II, Delft has been slowly expanding in both population and area. The trend in area expansion is continuing, due more to a decrease in average family size than to any further increase in population, which is currently 90,000.

Most trips to the center of Delft are made by bicycle or bus, the automobile being impractical due to the narrow streets, lack of parking, and traffic management measures that have been introduced. Average trip lengths are short, the land is flat, the climate is mild, and numerous facilities exist for the bicyclist; as a result, the bicycle accounts for nearly one-third of the trips made in Delft.

There are about 0.8 cars per household in the older Delft neighborhoods and 1.1 cars per household in the newer suburban areas. Parking is in short supply and is often metered or subject to residential permits. Parking lots are owned and operated by the city.

Bus service is provided by a regional operator. There are four city lines with 15 minute headways and six regional lines. Three bus types are used, depending on the route traversed: 12 meters (40 feet), 10 meters (33 feet) and 8 meters (27 feet) in length. Transit ridership has been increasing at an annual rate of 6%. There are no special services

for the handicapped and elderly, although the elderly ride the regular system at half fare. A major intercity railroad line borders the western edge of the old city, as does an LRV line to The Hague.

9.2 Institutional Arrangements

9.2.1 Local Level

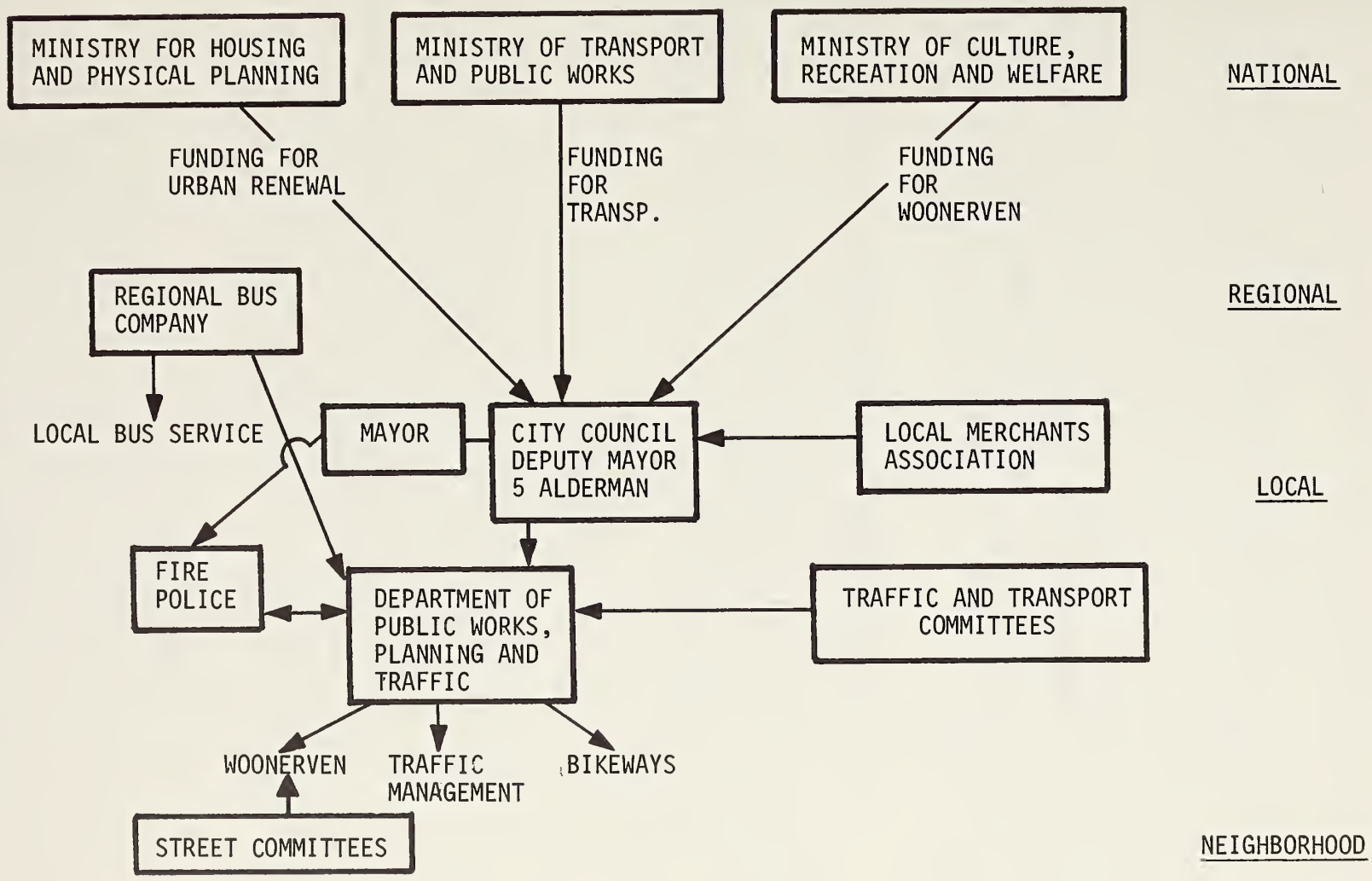
Delft has a City Council consisting of 35 members elected for four years. Five aldermen and one deputy mayor are chosen from and by the Council. The national government appoints a mayor who has certain responsibilities related to services supplied directly by the national government, such as fire and police. The Department of Public Works is responsible for developing and implementing all land use and traffic plans and it has been this vital organization that has pioneered so many of Delft's successful innovations.

There are several informal groups that provide input into the planning process: the Local Merchants Association; environmental and public-interest groups; the Public Traffic and Transport Committee that includes planners, police, social workers, traffic engineers; and other interested citizens and local street committees.

9.2.2 Regional Level

The regional government, the Province of South Holland, has had little impact on developments in Delft. The area is served by the Westnederlands Bus Company, a branch of the national bus company that is owned by the nationalized Dutch railroad. It provides all bus services in Delft and has a close working relationship with Delft's Public Works Department.

DELFT INSTITUTIONAL STRUCTURE



9.2.3 National Level

The Dutch national government provides funding but for the most part plays an indirect role in the transportation related affairs of the cities. The Ministry of Transport and Public Works sets national transportation policy and has provided funding for Delft's transportation improvements. The Ministry for Housing and Physical Planning and the Ministry of Culture, Recreation and Welfare are concerned with local environmental amenities and improvements and have provided funding for innovative street design in Delft.

Coordination of land use planning and transportation planning at the national level is achieved by cooperation at both the planning and policy levels of the Ministry of Land Use Planning and Housing and the Ministry of Transport and Public Works and related policy statements require the signature of both Ministers.

9.2.4 Sources of Revenue

In the Netherlands there is no direct link between specific taxes and the uses to which the revenues they generate are put. Income and corporate taxes make up 50% of the national government's money supply with the remainder coming from the value added tax. Some of these revenues are returned directly to the local and provincial authorities, while others are apportioned to the different ministries by the Parliament.

9.2.5 Funding to Cities

Every five years cities must prepare a traffic circulation plan which is discussed among national and local planners and policy people at a series of meetings. The Ministry of Transport and Public Works has developed a broad based policy

statement on traffic and transportation and this serves as a guideline for reaching decisions. The government bases its decisions on how well these plans comply with national policy, and on relative levels of service among cities. The government may modify funding requests, but all eventual grants are on a 100% basis.

The transportation innovations in Delft were initiatives of the city with the central government providing demonstration funding grants. Since then the government has incorporated many of these ideas into its official policy and is now actively encouraging their implementation in other cities.

9.3 Planning Environment and Accomplishments

Until the mid-1960's, the policy in Delft was to increase the infrastructure required by the automobile. This policy has since changed to favor walking, bicycling and public transportation. Transit has been given priority through the implementation of reserved bus lanes, queue jumps, bus-only streets, signal preemption and real-time computerized signal control. The bicyclist can travel safely over a city-wide network of separate bike paths and specially designed and signalled intersections. The pedestrian has been provided with traffic free streets and squares and special precincts known as "woonerven" where motorized vehicles are permitted, but their power has been greatly diminished. Finally, the use of the automobile has been restrained by a modified cell system in the central area and a restrictive parking policy.

The philosophy of the Delft Department of Public Works, which has been responsible for these innovations, can be summarized as follows:

- Work in a small scale way, step by step, with a multidisciplinary approach and a multifunctional use of the public space and the objects in it;

- Put proper emphasis on the social and environmental qualities of planning solutions;

- Start by looking for simple, cheap and reversible solutions instead of immediately aiming at complex and expensive technical ones;

- Keep in mind that planning problems are usually part of an array of problems and planning solutions should take a global outlook; and

- Have the people concerned participate in the decision-making process as much as possible.

The following sections describe some of the results of this philosophy.

9.4 Bus Priority

A major policy decision in Delft is to improve public transportation and make it as convenient and efficient as possible. Monthly and weekly passes, routes passing within 1,000 feet of most houses, 15 minute headways, convenient transfer points and on-board, two-way radios to facilitate transferring all contribute to an increased level of service. Bus efficiency has been improved by reserved bus lanes, queue jumps, bus-only streets, signal preemption and a real-time computerized signal control. Police, fire and other emergency services also use this priority system.

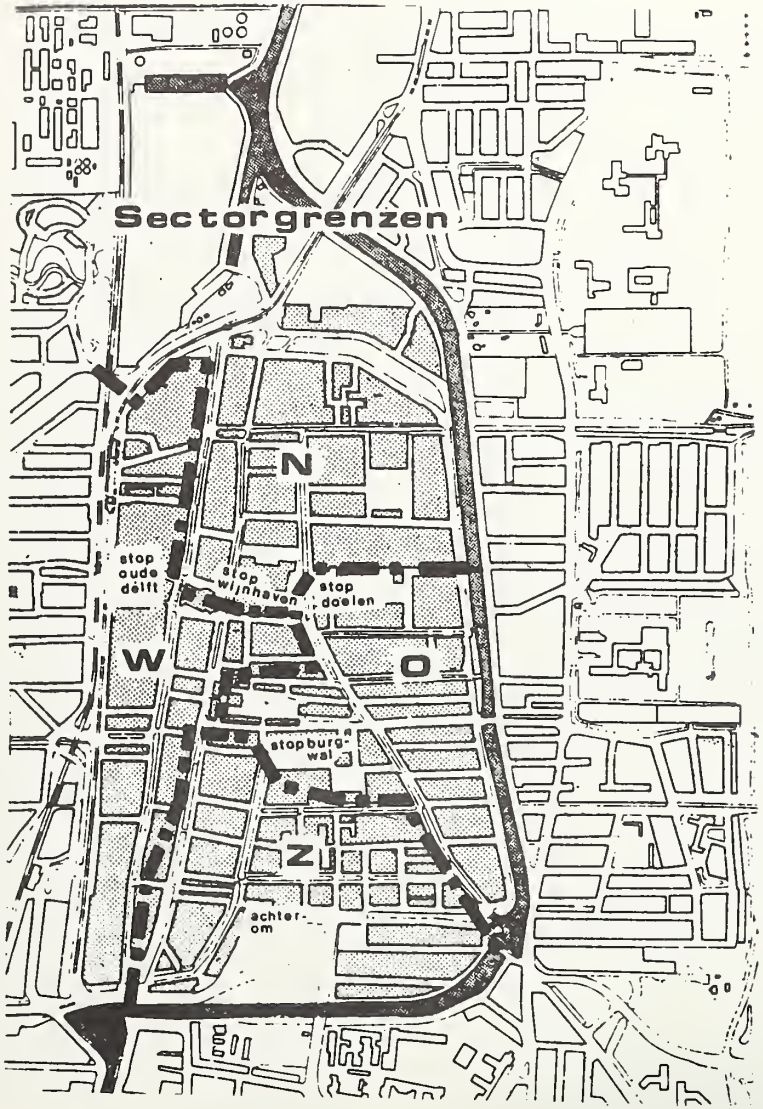
Both surface changes and signal changes have been introduced together. Separate lanes, sometimes along LRV rights-of-way, are provided where bus frequency warrants them; otherwise queue-jumping lanes are used at intersections. Bus-only streets are found in the central area permitting buses to cross the boundaries of the cell system.

Sixteen signalized intersections are equipped for bus preemption (VETAG system). A signal is passed from a battery-powered transponder in the bus to a loop buried in the road that either holds the green or terminates the red phase. The result has been an increase in reliability and average speed during congested periods and, therefore, a reduction in the required number of buses. There is no doubt that the system, which costs about $12,000 per intersection, has easily justified the cost.

The Department of Public Works has developed a computer algorithm that dynamically modifies traffic signal splits every second based on vehicle flows picked up by detectors buried under the roads. This system will eventually be expanded to automatic vehicle monitoring so that buses can be given system-wide priority and schedules can be modified as the real-time situation dictates.

9.5 Central Area Traffic Cell System

A modified traffic cell system has been introduced in the central area in order to discourage through trips and to improve the environment for pedestrians and cyclists. The area is divided into four cells, the boundaries of which can be penetrated at only a few points to facilitate goods deliveries. However, since these possible through routes have been designed to be inconvenient, through traffic has been successfully discouraged. While auto use has been restrained, transit has been improved. A new North-South bus route through the area has been implemented using specially designed 25 foot buses capable of maneuvering on the narrow streets and hump-backed bridges. The buses can open a gate that serves as a portion of a cell boundary.



Delft Central Area Cell System

Central Area Pedestrianization

Bus Operated Gate at Cell Boundary

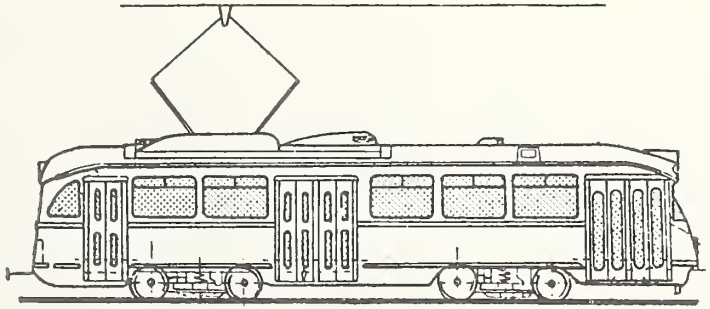
9.6 Bike-Way System

Used for about one-third of all trips, the bicycle plays a major role in transportation in Delft. The Department of Public Works has an active bicycle program that has resulted in a comprehensive bicycle system containing the following: bike lanes at curb-side or lanes completely separated from the roadway that are protected from the automobile, sheltered from the elements by trees, constructed as flat as possible and illuminated; specially designed intersections and signals for bicyclists; information signs for both automobilists and cyclists; adequate and secure bicycle storage facilities in all areas of the city; bike-only paths that give direct connections where roads are not wanted; bridge links over canals giving short-cuts to cyclists; underpasses to give short and safe connections beneath roadways; and bike rental facilities at the train station.

9.7 Woonerf

One of the most successful concepts for diminishing the influence of the automobile on urban life has been pioneered in Delft by the Department of Public Works. The Dutch call it "woonerf" (the plural is "woonerven"), and it results in taming the automobile (but not excluding it), thereby opening the street to multiple use - a place to meet friends, a safe area for children to play, a pleasant environment in which to walk.

In Delft, as in so many American cities, the historical functions of streets had been forgotten; all available street space was filled with stored vehicles (sometimes infringing on the already too narrow sidewalks) and moving sources of environmental nuisance and danger. Yet, while only about 10 to 15% of the city's streets had a real traffic function (which is probably not very different from most American residential areas), the design of all the streets favored the automobile.



Public Transit Vehicles
in Delft

Delft Bike Path

During the early woonerf planning stages complete segregation of cars and pedestrians was rejected due to problems in providing adequate access and the desire not to create noisy concentrated play areas. What emerged was a concept of integration, with everyone - motorists, bicyclists, children playing and pedestrians - making use of the same communal space. The woonerf helps to solve the problem of traffic danger and to restore the environmental qualities of the street as a place to live. It is neither a traffic-free area nor a vehicle restraint scheme of the type found in areas of Berkeley or Seattle.

The woonerf has four essential components: vehicular traffic is slowed to a pace compatible with that of the pedestrian, a pedestrian ambiance is created, parking is limited and is often reserved for residents, and a public transit alternative is provided. Vehicular traffic is slowed by narrowing the width of the roadway, putting in sharp turns, and installing speed bumps and other obstacles such as bollards, trees, benches and lined parking spaces. The space between the buildings is resurfaced with no distinction made between sidewalk and roadway to encourage pedestrians to use the entire width. Amenities such as trees, benches and bike racks further increase the feeling that the entire space is meant to be used by the pedestrian.

The woonerf design contains clearly marked parking spaces, sometimes restricted for use by residents of that particular street. If adequate parking cannot be provided in the woonerf, supplemental parking is provided nearby. In order to provide an alternative to the automobile, convenient public transit is always provided on neighboring streets (the woonerf design does not permit bus access). The distance of any house to the nearest traffic street must be less than 1,500 feet. This criterion, plus the impact of the diverted traffic on neighboring streets,

"Woonerven" in Delft

serves to limit the size of the woonerf in already existing neighborhoods, but not in new developments where adequate ring roads and penetrating bus-only streets can be incorporated in the design.

The first woonerven, implemented in 1970, were very extreme in design and were developed without citizen participation. As experience was gained, the newer designs became less costly, easier to maintain, and more functional. Since then, a well-organized design procedure including citizen participation, which is considered very important, has been developed.

The preliminary design is decided by a permanent committee composed of officials from the maintenance, public amenities, planning and traffic offices of the Delft Department of Public Works and the Police. Careful attention is afforded the placement of underground facilities and access by emergency vehicles and for store deliveries. During the detailed planning and implementation phases, this group works directly with the citizens living on the blocks affected. Decision to construct a woonerf through implementation takes btween 9 and 18 months.

There are, at present, 15 woonerven in Delft, in all types of neighborhoods: older, densely populated inner areas with narrow, congested streets; post World War II developments of single family detached houses reminiscent of many American suburbs; new high-rise apartment developments; new town house developments; and a few commercial streets as well. While the concept remains the same, each area evokes its own design characteristics and poses its own set of problems. Woonerven in new developments are the easiest to construct since one is starting from scratch. Yet woonerven in high-rise developments are often windy and less pleasant than in other areas, while in the town house developments there is little room for "adequate" parking. The most difficult areas in which to design woonerven

are the dense, inner city neighborhoods where adequate diversion routes and parking facilities are hard to find. Providing too many parking spaces damages the quality of the environment. In all areas the accommodation of large vehicles such as vans, delivery trucks, fire engines, etc. requires design standards that make it difficult to limit successfully passenger cars, and mopeds are a problem to control.

The nature of the subsoil in Delft dictates that roads must be reconstructed every five years, making it easier to accomplish design changes in a shorter period of time. The Department of Public Works and the Police compile a list of streets appropriate for woonerf treatment on a yearly basis. This list is compared with one of streets in need of major maintenance or reconstruction.

Woonerven cost between 30 and 80% more than normal streets, depending on the particular design and the subsurface conditions. Costs have been covered by grants from the Ministry of Transport and Public Works, the Ministry of Housing and Physical Planning and the Ministry of Culture, Recreation and Welfare.

In 1976 the Ministry of Transport and Public Works defined the following set of traffic regulations and minimum design standards for an area to be officially called a woonerf:

- A woonerf must be primarily a residential area;
- Through traffic should be excluded;
- No road within a woonerf should carry a flow of traffic which will affect the character of that road as a part of a woonerf;
- There must be adequate parking facilities for the residents of a woonerf;
- The entrances and exits of a woonerf must be so designed that they can be clearly recognized;
- The word "Woonerf" must be displayed;

- Parking should be clearly marked and is limited to specific areas;
- There is to be no separation between roadway and sidewalk; pedestrians may use the full width of the roadway;
- Features not more than 150 feet apart must be introduced on the roadway to restrict vehicle speed;
- Drivers must not drive faster than a walking pace;
- Woonerven must have adequate lighting for safety;
- Street objects should not restrict visibility;
- Vehicles should not be forced to pass too close to housing;
- While playing is possible everywhere, special areas can be set aside and traffic prohibited;
- Drivers may not impede pedestrians and pedestrians may not impede drivers.

Some people are of the opinion that these standards have served to diminish creativity in woonerf design.

Since, until now, woonerven have been implemented on a piecemeal basis in small sections of the city, the Ministry of Transport and Public works is funding two larger woonerf experiments, each about two-thirds of a mile on a side, in Rÿswijk and in Eindhoven. These woonerven will have buses and LRV's running through them. In addition, Delft is preparing comprehensive transportation and land use plans for three large sections of the city that contain several small woonerven.

9.8 National Policies

The following sections discuss policy areas of national concern in the Netherlands: the use of various modes, a national fare policy and service to the handicapped and elderly.

9.8.1 Modes in the Netherlands

In Dutch cities one can find buses of all sizes, LRV's and, in Amsterdam, one metro line. A mode cost comparison study is currently being funded by the Ministry. It appears that the size and density of Dutch cities are not sufficient to support metro construction. LRV's are less expensive to operate than metros, considerably less expensive to build than metros, and it is easier to provide reserved lane facilities for LRV's than for buses where road space is lacking, since they can be designed much narrower than buses (as in Amsterdam). Preferential treatment for LRV's and buses is encouraged at as many signalized intersections as possible. Marketing studies have shown that the Dutch prefer LRV's to buses and that people find LRV routes easier to identify.

9.8.2 National Fare Policy

The Transport Ministry sets fares throughout the country. However, it is constrained by the Ministry of Economic Affairs that has determined that fares cannot be increased faster than the cost of living, even though transportation costs often increase at a more rapid rate. Within these limitations the Transport Ministry has been adjusting fares to comparable levels throughout the country and parity will be reached in another six years. Most cities, due to their small size, have flat fare systems, but zonal restrictions have recently been introduced in Rotterdam and Amsterdam. Fares cover approximately 25% of operating costs nationwide and about 20% in Amsterdam.

Recently the National Railway (a state-owned but privately-operated company) introduced a family fare card in an attempt to make inter-city rail competitive with the automobile for families travelling together. The primary card holder pays a large amount, approximately $1,100 per year, the second person

$75 per year, the third $50 and so on. The arrangement is earmarked for long distance commuters; the price is less than the yearly commuter fare between Amsterdam and The Hague, for example. The major problem has been deciding the definition of a family and "living together and married" has been changed to "living together permanently". Impacts are not yet known, but thought is being given to extending the validity of the card to all providers of public transportation. While this policy is very pro-transit, and while new road building has been seriously curtailed, the Ministry of Transportation recently announced a plan to remove bottlenecks on inter-city freeways.

9.8.3 Handicapped and Elderly

The Netherlands has been developing policies for the transport of the H and E over the past four years. The cost for making the country's transportation systems accessible to the 40,000 citizens in wheelchairs (20,000 of whom drive their own cars) has been estimated to be far too expensive to attempt. Instead, small changes are being implemented in order to make service more convenient for the less severely handicapped. An investigation into improved access to LRV's has resulted in design modifications calling for lower entry steps and a better hand rail design. The Dutch bus manufacturers have been asked to explore the possibilities of lowering bus floors, but due to the small number of buses involved (most buses are manufactured for private use), they have responded less than enthusiastically. Ramps are being installed in principal railway stations. Special services for the handicapped do exist, but these are provided by private interest groups or social service organizations and subsidies, if any, come only from the local governments. There is a national steering committee for handicapped persons consisting of representatives from several ministries and private interest groups.

It could be that less attention is paid to providing service to the H and E in the Netherlands and other European countries than in the United States because, in Europe public transit is considered to be for all segments of the population, of which the H and E represent a much smaller proportion than in the United States, where public transportation is often thought of as being supplementary to the car and where the young and the old represent a greater share of the ridership.

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10. GOTHENBURG

10.0 Summary

	Population	Area	Employment	Motorization
City	450,000	172 sq. miles	240,000	120,000 cars
Region	693,000	1,131 sq. miles	327,000	3.9 persons/car

Gothenburg is the second largest city in Sweden and is a commercial and shipping center. The city government is run by a 21 member Municipal board, headed by a chairman and selected by and from the publicly elected Municipal Council. The City Planning Office has been responsible for Gothenburg's many transportation and land use innovations. The national Ministry of Transportation provides funding only for road building and roadbed construction for metro and pre-metro systems. Most funding for public transit, therefore, is supplied by the local government.

The heart of Gothenburg's public transit is the 80 mile LRV network. Regular buses serve as feeders to LRV terminals and articulated buses are used both as feeders and for line haul service, operating at times over LRV rights-of-way. While studies have indicated that a metro would not be cost-effective for Gothenburg's density and travel patterns, a pre-metro line has been constructed connecting Gothenburg with the new town of Angered.

Eighty percent of the LRV network is physically separated from other traffic, and a system of signal priority has been installed for both LRV's and buses. Fares are coordinated among all regional providers and a monthly fare card is available.

A separate service is available to the H & E, either in specially equipped small vehicles for which door-through-door service is provided or in taxis. Certification has been given to 20,000 persons. The average cost per trip is $7.60 with the trips by taxi being considerably less expensive than those by special vehicle.

Gothenburg's major traffic management accomplishment has been the traffic cell system implemented in 1970. The CBD was divided into 5 zones, the borders of which could only be crossed by public transit and emergency vehicles. A ring road was created around the CBD to accommodate rerouted traffic and the system of LRV reserved rights-of-way increased. As a result of the cell system transit regularity improved, public transit usage increased, and air pollution and noise levels within the cells decreased. Business interests have been very supportive of the plan.

The cell system caused a rerouting but not a decrease in overall traffic. The city's new traffic and parking policy attempts to restrain traffic as well. The cell system is being expanded citywide, parking in the central area will be limited and made more costly and land use policies will be followed that favor the efficient operation of public transportation.

10 .1 Introduction

Gothenburg is the second largest city in Sweden, with a population of approximately 450,000 inhabitants. The town was founded in the 17th century and as a result of the Gota river, the largest waterway in the country, it has developed into the leading commercial and shipping center of Sweden. The development over the years of the urban pattern and the transportation network has been influenced by three main physical factors: the Gota river; the topography; and the form of the old city. The river cuts right through the city forming a major barrier between the northwestern part with its extensive industrial and harbor facilities and the rest of the city. The topography is composed of plains and ridges, radiating from the center of the city. The old city, which is the present CBD, has a number of wide main streets, originally canals created by Dutch city planners. The canals were later filled and turned into streets about 35 meters (115 feet) wide. However, there is still a canal surrounding the central business district (CBD) at the site of the old ramparts.

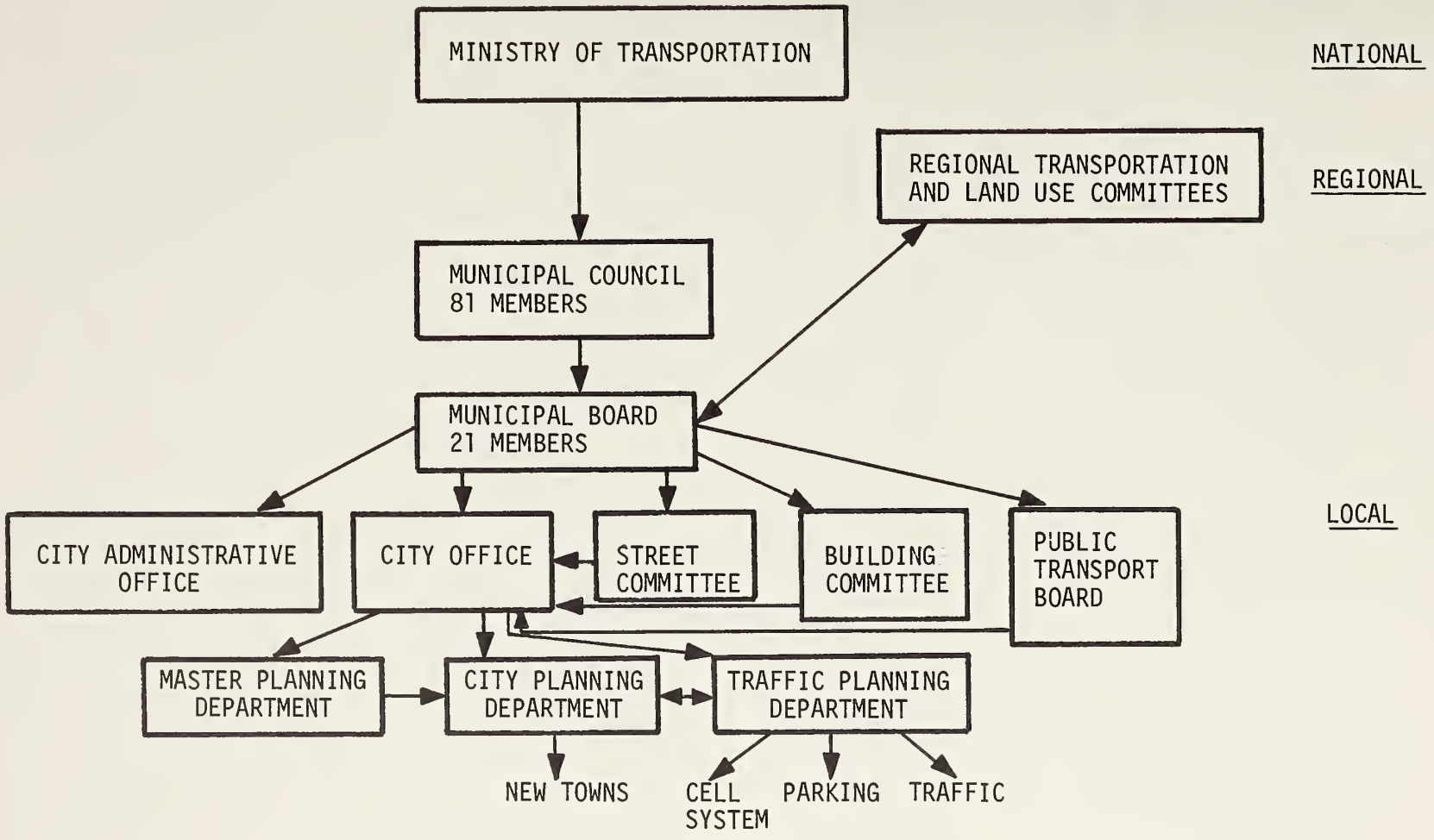
The city is relatively scattered with a medium density CBD. Very few buildings are higher than six stories. The number of inhabitants in the central urban area (CUA) is 35,000 and the number of jobs is 65,000. The other major employment center is the industrial area at Hisingen in the northwest with a total of 25,000 jobs. A main problem in the city is the unbalanced distribution of residential areas and areas of employment, creating a strong demand for working trips to the central urban area and also criss-crossing the city. For a number of years it has been a key land-use policy to reduce this imbalance. Up to the late 1960s it was thought that the Gothenburg metropolitan area was going to expand to the size of 1 million inhabitants

around the year 2000. Among the means to cope with this growth and with the imbalance mentioned above, was a planned new town (Angered-Bergum) in the northeast with a population of 100,000 inhabitants and employment for 30,000 people as early as 1980. The rapid population growth of the 1950s and 1960s has tailed off, the city is actually losing population to its surrounding municipalities and only a small part of the new town has been built.

Until the end of the 1960s there was only one bridge across the Gota river connecting the city center with the northwest. Rapid growth in car traffic soon created serious problems in the CBD and the road network adjacent to the bridge. This, together with a general trust at that time in the car as the predominant mode of future urban transport, led to the decision to build two high capacity river crossings for the road networks. In the 1960s a number of regional/national distributors were constructed, mainly in radial directions from the central areas of the city. In connection with preparations for the change in the Rule of the Road in Sweden from left to right in 1967, the whole road network was subject to modification. As a result, outside the central urban area a substantial capacity reserve in the road network was created. A ring road was also completed around the CBD.

Public transportation facilities, which are owned and operated by the municipality (Göteborgs Spårvägar or GS), consist of a light rail transit system, standard and articulated buses, and specially equipped small vehicles for the handicapped. The basic network is of distinctly radial design, and line-haul service is provided primarily by LRV supplemented by bus. Buses provide a feeder service in the outer areas.

GOTHENBURG INSTITUTIONAL STRUCTURE



10.2 Institutional Arrangements

10.2.1 Local

Gothenburg has an eighty-one member Municipal Council which is elected publicly every three years. The Council, with one ceremonial head, meets once a month to "rubber stamp" decisions taken by the smaller Municipal Board. The administration of the municipality is headed by the Municipal Board which also superintends the activities of the municipal committees and boards. Its twenty-one members, including the Chairman, are selected by and from the Municipal Council. Nine of them are City Commissioners. The Municipal Board is responsible for leadership and administration for long-term planning, administrative development work and central informational activities. Long-term policies are formulated in programs worked out by program committees. The Board has two staff sections at its disposal, the City Administrative office, which assists the municipal executive with legal investigation, secretarial, informational and survey work, and the City Office, which sees to the pre-planning of the central administration and which provides assistance in long-term planning. It is the City Planning Office that has been responsible for the traffic cell scheme, the new town developments, the coordination of land use and transportation and many of the other transportation-land use related topics of interest.

10.2.2 Regional

Gothenburg's 450,000 citizens account for more than half of the region's population. The neighboring communities have small planning offices and a joint committee of ten persons has been responsible for coordinating transit fares in the region and reaching decisions as to where in the region new housing should be constructed. A Gothenburg Councillor is represented on this committee. This is the only regional body relevant to the topic at hand.

10.2.3 National

Local communities develop transportation plans and petition the National Ministry of Transportation for funding. However, nearly all of this funding, which comes out of general tax revenues, must be used for road-building, with only road bed construction for metro or pre-metro (grade-separated LRV) being paid for by the Ministry. Thus, nearly all funding for public transit is the responsibility of the municipality and is raised through local income and property taxes.

10.3 Accomplishments

There are several important areas of interest in Gothenburg. A CBD traffic cell system was implemented in 1970 and it is currently being expanded city-wide. Traffic and parking policies have been developed and are being implemented with a major emphasis on traffic restraint.

While metro and downtown people movers have been studied and rejected, the LRV remains a major transit mode. The LRV's are afforded a high level of priority, travelling on reserved rights of way and preempting signals at intersections.

There is a region-wide coordinated fare system. Gothenburg provides high quality transportation to the H & E by subsidized taxi or specially equipped small vehicles. Finally, two new towns in the Gothenburg suburbs are instructive examples of this type of development.

10.4 CBD Traffic Cell System

10.4.1 Background

In 1964 the city developed a plan for the CBD area including a proposal for a traffic regulation scheme and a ring road around the CBD. The objectives behind this scheme were:

- that the layout of the old city center together with the scale of the buildings should be regarded as a cultural heritage and should be treated as such in the planning for the continued development of the CBD;
- that a clearly defined CBD, moderately sized, well utilized, but without a too high density should be developed;
- that the CBD should be effectively served by both public and private transport.

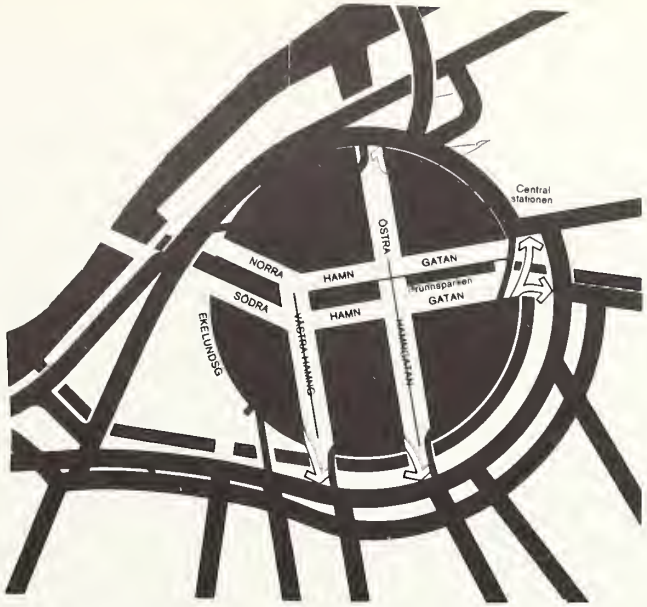
In 1970 the time seemed right, both with regard to the road network and opinion among politicians, the public and municipal administrators, and it was not a difficult task to implement the traffic zone scheme. In fact, the implementation in August 1970 was based on decisions made solely by the City Planning Board and the Traffic Regulation Board, after separate consultations with a number of other sectorial boards. No approval was needed by plenary meetings of the Municipal Council or other political bodies above the sectorial board level. After three months, however, the Municipal Council decided to approve the system. The detailed plan was carried out under a special commission comprised of representatives from the City Planning Office, the Street Office, the Transport Authority and the Police. The objectives of the scheme were to attain:

- improvement of safety and the environment for people living, working and walking in the CBD;

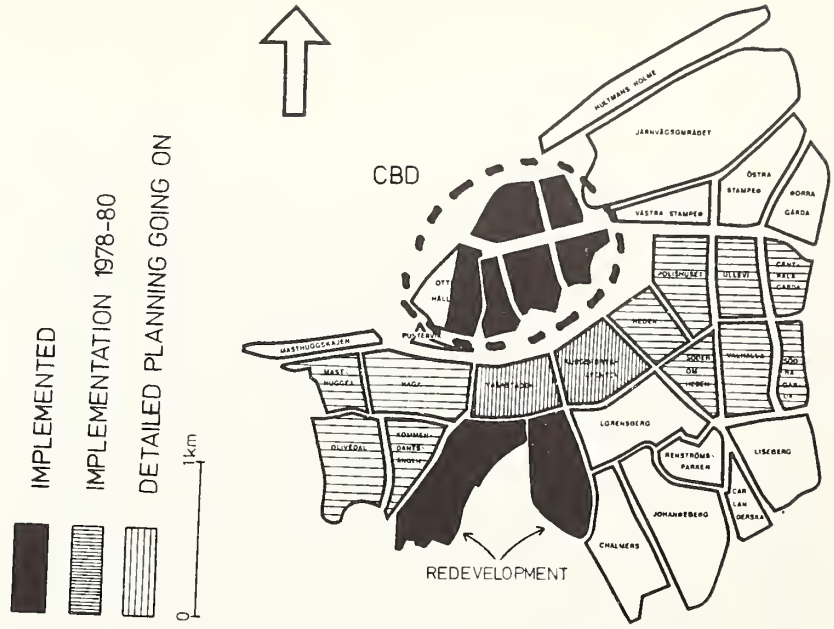
- improvement of the operation, regularity and reliability of public transport;
- rapid accomplishment of any proposal without too extensive and expensive modifications.

The cell system had the following principal features:

- the CBD was divided into five separate traffic zones, marked in accordance to their geographical location as NE, NW, SW, S and SE: (NO, NV, SV, S, SÖ in Swedish);
- the borderlines between the zones could not be crossed by vehicular traffic except for public transport and emergency vehicles. Taxis were included among the prohibited vehicles (exemption at one point was later given). The same rules applied to bicycles and mopeds, but it was permitted to wheel bicycles and mopeds over pedestrian crossings;
- traffic to and from a zone had to use the entrance and exit leading to the ring road;
- inside each zone there were no large changes. The current parking policy prevailed. No streets other than the previous pedestrian streets were closed to traffic, either totally or as cul-de-sacs. Traffic movement within the zone was regulated mostly by one-way streets, as before, and by directing entering traffic through the zone and out again in an uncomplicated manner;
- buses and trams followed the same routes as before, but now with reserved lanes in several places. These lanes constituted also the borderlines between zones.



Original Cell System



Expanded Cell System

Central Area Pedestrianization

Cell Boundary Being Crossed by an LRV

10.4.2 Information and Public Participation

Two information pamphlets were published using an advertising firm for layout and design. One month and a half preceding the change 16,000 copies of the first were sent to all apartments, offices, shops, cinemas, etc., within the CBD explaining the objectives and how they would be carried out. Three weeks in advance 300,000 copies of the second giving information on the new scheme, proper route selections and changes in public transport operations were distributed to every household in the metropolitan area and displayed in gasoline stations, garages, hotels, etc. The final stage of the information campaign included advertisements in the local Gothenburg newspapers for the three days preceding the change and a special program on TV and in the local radio station, starting early in the morning of the first day, giving advice on route selections for the motorists.

Throughout 1970 special information and consultations had been given to particular interest groups including taxi drivers, the police and the Retail Association. Particular attention was given to the police. After they were properly informed about the system and how it was supposed to work, they became convinced of all the advantages and were in favor of the system. This was thought to be of significant importance because the police were given a key role in the first days after the change directing, helping and informing the motorists.

10.4.3 Other Traffic Policy Actions 1970-74

In 1973 the zone system was made permanent by replacing street paintings, removeable concrete blocks, etc., with permanent physical installations. A few intersections were also reconstructed and a number of crossing points for pedestrians were marked by use of special pavement. Parts of a tramway line were relocated to a more central location. The relocation was made possible by the reduction in through traffic.

From 1970-74 the proportion of physically reserved LRV tracks was increased from 65% to 80%. In connection with this, signals giving priority to LRV's were installed in forty signalized intersections. During this period the aims of the parking policy were to convert the use of parking spaces from long term to short term parking, and to replace street parking with public indoor garages, while keeping the total number of parking spaces in the CUA at about 40,000.

10.4.4 Evaluation

The cell system did not reduce transit travel time, but did improve regularity. This led to a 2% savings in operational costs for GS since standby LRV sets were no longer needed. Interviews with travellers indicated that there were 6% more trips to the CBD on public transit than before. The main reason given was the difficulty in finding a parking space, since if one zone is filled, there is a considerable way to drive to search in the next zone.

The continuing decrease in transit ridership during the 1960's was reversed, and ridership increased by 8% between 1970 and 1975. This was attributed, in part, to the rise in gasoline prices in 1974, but also to the reserved lanes, traffic signal priority, uniform fare and express bus routes.

A reduction of the vehicular volume in the order of around 40% was found on some CBD streets that had previously been through routes. The ring road registered an increase of up to 25%. Total vehicle miles in the area increased 1%.

Despite the increase in vehicle volume on the ring road, surveys based on the floating car method indicated an increase in travel speed from 16 km/hr to 23 km/hr along the road clockwise, and from 15 km/hr to 22 km/hr along the road counter-clockwise.

The explanation of this is partly the reconstruction and change in signalization of an important intersection, but is also due to the reduced volumes on radial routes which give longer green intervals to the ring road at signalized intersections.

The use of municipal car parking within the CBD decreased slightly (5% on average on weekdays) after the implementation of the scheme. Three months after the implementation date, the parking fee was raised from Sw. Kr. 1.00 ($.25) to Sw. Kr. 2.00 ($.50) per hour in the CBD, which seemed to reduce the turnover with another 5%

By 1974 accidents with injuries in the CBD had been reduced by 50% and on the ring road by 25% compared to the situation in 1969. There was a saving of 20 to 30 policemen due to the zone system.

The environment for people living, walking and working in the CBD has improved considerably. Noise levels on the main CBD shopping street fell from 74 dBA to 67 dBA and no complaints from the public have been registered due to the increased traffic volumes along the ring road. CO levels fell from 60-70 ppm to 5 ppm in the traffic-free area. The Retail Association has been a continuous supporter of the cell system, although it has been difficult to attribute specific changes in economic activity to the changes. The zone system was received favorably among customers and visitors to the CBD.

In the beginning the taxi drivers complained strongly against the system, arguing that taxis should be regarded as a form of public transport and be allowed to drive in the public transport lanes and to cross zone borders. Relocations of taxi stands and permission to cross the zone borders at one point have reduced the complaints somewhat.

The cost of the cell system, not including the ring road improvements which were accomplished independently, was Sw. Kr. 5,405,000 or about $1,250,000.

10.5 Current Traffic and Parking Policy

The CBD zone system resulted in traffic rerouting, but not traffic restraint. Results have shown that if a significant modal shift to public transit is desired, it is not sufficient to merely improve transit, but more severe restrictions must be placed on automobile use. With this in mind, a traffic policy with the following elements has been proposed:

- improve public transit including new LRV's, an extension of the network, and more priority;
- improve the cyclist and pedestrian network by creating safe and convenient access points between cells;
- increase the use of parking as a restraint device in the central area;
- extend the cell system city wide (two new cells in 1979);
- improve safety through black spot approach;
- favor land use plans which ease the provision of a good public transport service (most new housing construction during the next five years will be in the center);
- limit heavy traffic in residential areas at night;
- change national regulations to make these measures easier to implement.

A parking program to restrain the use of the automobile and achieve a better use of space in the CUA has been developed. Residential parking is given priority with restrictions falling heaviest on commuters rather than visitors. Commuter parking will be reduced from 21,000 to 17,000 spaces and visitors'

parking from 10,500 to 9,500 spaces. Remaining parking spaces will be relocated from the center towards the periphery of the CUA. Parking charges will be increased and public transport improved. Experiments will be conducted with carpool parking and park and ride facilities. It is anticipated that reduced traffic flows will make it easier to create traffic cells and to give priority to public transport and pedestrians.

10.6 Public Transit

10.6.1 Introduction

Goteborgs Spårvägar operates a fleet of 327 LRV's, 313 buses (standard and articulated) and 39 specially equipped vehicles for the handicapped. The nine LRV routes are radial in structure as are some of the new bus routes that penetrate the city center. Other buses provide feeder service to these principal routes. **Operating costs are covered equally by the fare-box and city taxes. Fifty-seven per cent of operating costs are for labor.**

10.6.2 System Evolution

During the 1970's GS conducted comparative studies on metro, LRV, bus (articulated and standard) and downtown people movers (DPM). Densities and trip patterns were found to be insufficient to justify a metro, but a "pre-metro" LRV line was built connecting the center of Gothenburg to the new town of Angered. All station facilities, tracks and tunnels were designed so that the system could easily be converted to metro operation in the future. Other extensions of the transport system were primarily additions to the feeder bus network and the introduction of line haul bus routes penetrating the city center and often travelling over rights-of-way previously reserved for LRV's. A decision was reached to abandon the DPM project, and in 1978 it was decided to maintain the current balance between LRV and bus. Beginning in 1985 the first of a fleet of 300 modern LRV's is scheduled to be put into revenue service. Specifications for these vehicles are being developed locally.

10.6.3 Operations

In order to increase productivity, articulated buses have been introduced on heavily patronized routes and LRV's, each capable of carrying 120 passengers, have been joined into trains of up to 4 vehicles. Since each LRV is equipped with automatic ticket cancelling machines and unions have not precluded the practice, only one driver per train is used. In the evening, for security reasons, LRV's travel singularly.

LRV's and buses are equipped with communication radio to improve reliability. The standard of stops varies substantially from completely unprotected stops at street curbs to heated shelters with seats on wide aisles. Accidents on the LRV system vary with the degree of physical separation from other traffic.

10.6.4 Priority Treatment

Approximately 80% of the 80 mile LRV network is physically separated from other traffic, either by striping or concrete curbs or is grade-separated. Reserved rights-of-way are designed into all extensions of the city. GS studies have indicated the importance of signal priority at intersections. As a result, 70 intersections have signal priority for LRV's and 20 intersections are equipped for bus priority. In suburban areas buses are afforded access to bus-only streets by controlled gates.

10.6.5 Coordinated Fares and Revenue Distribution

Fares and revenue distribution have been coordinated by a committee of officials from all local governments in the Gothenburg region. A circular zonal fare system has been created and a monthly fare card introduced. Otherwise, tickets may be purchased at numerous retail stores throughout the city or from the driver, but at additional cost. Officials feel that the unified fare system has increased transit ridership, particularly

for journeys with an origin or destination in the suburbs. To encourage off-peak shopping and recreational trips a free return is offered for those travelling between 9 a.m. and 3 p.m.

10.6.6 Handicapped and Elderly

Prior to 1967 transportation for the elderly and handicapped was accomplished by private welfare agencies. The City Council then decided that this type of service should be a part of the city social program and that this transportation should be handled by a city owned agency. The decision was taken that GS should handle this work. Operation under city ownership started in April 1967. It was decided to create a separate service since it would be too costly, ineffective and inefficient to make the current system totally accessible. However, stations on the new pre-metro LRV line have been equipped with elevators.

Eligibility to utilize this service is determined by the social and welfare department of the city. To be eligible the applicant must be a resident of Gothenburg and must go through a medical examination by the department's doctors. Persons receiving an eligibility certificate are permitted to request as many trips per month as they wish for school, work, or medical treatment. In addition, they may request 12 leisure trips per month if they are confined to a wheelchair requiring the utilization of a special vehicle, or 10 leisure trips per month if the handicap only requires a taxi. Along with the eligibility certificate the person also receives a boarding permit, special checks for payment, and instructions for use of the system.

For trips to school there is no charge. For trips to work or medical treatment and leisure trips the fares established from June 1977 are Sw. Kr. 2.00 ($.50) for adults, and Sw. Kr. 1.00 ($.25) for children up to the age of 16.

For the less physically disabled GS has arranged an agreement with the taxi cab company of Gothenburg to purchase transportation service. Those persons contact the taxi cab company directly and request transportation as anyone would request taxi service. They pay, however, with special checks, and the taxi cab company has to be notified that payment is going to be made in this manner. A free trip by taxi has to be arranged through GS, not directly by the customer. For the seriously handicapped and those in wheelchairs, a fleet of specially equipped, radio dispatched vehicles (7 Mercedes mini-buses and 32 Peugeot J7 vans) is used. Subscription and 24-hour advanced reservation services are provided. Drivers assist passengers in getting from their residence to their destination ("door-through-door" service).

The area served by this service is currently 109,000 acres with a total population of around 440,000. The number of people with eligibility certificates is 20,000, i.e. around 4.6% of the population. About 15,000 certificates are held by people 67 years of age or older. The service is available 24 hours a day.

The number of trips provided in 1977 was:

Type of Service	Number of Trips by Eligible Persons	Number of Trips by Attendants
GS special vehicles	95,017	17,659
Taxi cabs or other agencies	1,529,030	468,459

The distribution related to purpose and type of service was:

Trip Purpose	Special Vehicles	Taxi Cabs
Work	8%	5%
School	10%	20%
Treatment	62%	25%
Leisure	20%	50%

The total staff is currently 93 people, 70 drivers and 23 administrative personnel. This organization is a separate branch of the transit authority, and the transit system bus drivers are not eligible to drive these special vehicles. There is a special driver category for this operation.

The transit authority is paid fully for the costs of providing this service over and above the budgetary allocations of those agencies requesting service: the social and welfare administration, the school administration, and the hospital administration. The total cost for providing this service for the fiscal year 1977 was MSw. Kr. 49.5 (M$12.4). The budget for the fiscal year 1978 was MSw. Kr. 56.7 (M$14.2).

The average cost for producing a trip is as follows:

		Sw. Kr.	$
Special vehicles	Restricted number of trips	129.81	32.45
" "	Unrestricted number of trips	66.33	16.58
Taxi cabs	Restricted number of trips	31.56	7.89
" "	Unrestricted number of trips	22.63	5.65

The average cost per trip is $7.60.

Thirty-five percent of the cost is paid by the national government. The remaining part is paid by the city.

10.7 New Towns

There have been several new towns built in the outskirts of Gothenburg during the past 15 years. Two of these are of particular interest since they are both connected to the city center by high quality LRV and illustrate totally different design philosophies. Västra Frölunda is a suburb about 4½ miles (7 km) southwest of the city center covering an area of 495 acres (200 hectares). The housing units were built mainly between 1960 and 1967 and contain about 11,600 apartments in high-rise buildings and 500 in smaller ones. The population is estimated at about 37,000

In the center is Frölunda Torg, a commercial and service center intended to serve the south-western districts of the city and used by a population of about 100,000. The main building in the center complex includes a two-storey shopping mall. The LRV station is connected directly to this building on the bottom level, while the next level opens out onto a large square leading to a feeder bus terminal and a 3,000 space car lot. The upper level contains a restaurant and offices. Nearly all goods transportation is via an underground commercial service street. Directly connected to the mall are two department stores.

Next to this complex is a 17 storey health center and 7 housing units with about 800 apartments. Close by a school, library and sports facilities have been planned. There are almost no employment opportunities in Frölunda.

About 6 miles (10 km) north of the city is the newer Angered development. Since the projected growth for the region never materialized, the original plan for a community of 100,000 persons has been greatly modified, and today 35,000 persons live in the area. Unlike Frölunda, where the housing and the commercial center were built at the same time, Angered is being constructed on a piecemeal basis and planners are proceeding slowly and cautiously.

The first housing units were finished in the early 1970's, but only recently has the commercial center been opened. A newly constructed pre-metro LRV line connects the commercial center with the center of Gothenburg. The line is completely grade-separated and speeds, including stopping, average 30 miles per hour. Public transportation to Angered's "suburbs" is provided by feeder bus. A completely separated system of sidewalks and bicycle paths has been created with numerous short cuts via pedestrian bridges and stairs.

Mixed Use in the New Town of Angered

LRV and Bus Transfer Point at Angered Center

3-Car LRV "Pre-Metro" to Angered

Angered's center exhibits much more of a mixed-use development than Frölunda's. Commercial, social and cultural facilities fan out from the central square, and the design is more reminiscent of an old town than a modern shopping mall. Five hundred apartments have been mixed in with these other uses, light industrial facilities have been constructed within walking distance and plans call for 6,000 industrial jobs in the area. A segment of the city's ring road has recently been completed connecting Angered with the large industrial area to the west.

Environmental considerations have played a major role in Angered's design in contrast to Frölunda's, and much of the natural beauty of the area has been preserved. In order to minimize costs, apartment buildings have been prefabricated and assembled on site in row after row of identical structures. While some of these suburban developments have been considered failures by city officials and citizens alike, a great deal has been learned and the latest development, consisting of identical apartment buildings arranged in a rectangle around an enormous untouched wooded area with access roads and parking on the outside, has been very successful. Some private homes are also being constructed.

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11. LONDON

11.0 Summary

	Population	Area	Employment	Motorization
Central	330,000	10 sq. miles	260,000	1.825,000,000
Greater	7,000,000	610 sq. miles	3,800,000	3.9 persons/car

London is the seat of British government and parliament, a national and international financial, commercial and cultural center and the home of the major national institutions. Greater London includes the historic walled City of London, with its own Lord Mayor and Council, and 32 other units of local government, the London boroughs.

The Greater London Council (GLC) is the powerful regional government and is the overall planning authority for Greater London. The GLC has developed a strategic land use and transportation plan for London, directs the London Transport Executive (the LTE is the operating authority for the Underground and red buses), applies for and dispenses the Central government's block grant to the boroughs, the LTE and British Rail (BR operates commuter trains into London) and has been responsible for most transportation innovations. The Department of Transport oversees all national transportation policy to the local and regional authorities.

London's public transport system is characterized by dense rail and bus networks, and 90% of work trips to central London are made by public transit. Yet, due to through traffic and the high level of activity and population density, the central area is congested

during the entire working day.

In an attempt to alleviate this congestion, parking restraints have been imposed over a 40 square mile area. The parking program has resulted in a shift from on-street to off-street facilities and serious congestion levels still remain. The GLC has recently proposed an area licensing scheme for the most severly congested 6 square mile portion of inner London. All entering traffic would be required to purchase a pass at a cost of $1.00 per day. Implementation of this scheme is expected to discourage through traffic and cause a shift to public transit for some trips entering the center.

London represents a city that has realized major transportation improvements while operating under serious financial constraints. In an attempt to improve the flow of traffic, particularly surface transit, and the environment, the GLC has developed and implemented an impressive low cost traffic management program. Twenty-six miles of bus lanes are operating in 150 locations. Since buses are used mainly for short journeys, these facilities are predominantely queue jumps (in contrast to the continuous system in Paris). A principal shopping street (Oxford Street) has been turned into a transit mall for buses and taxis and the sidewalks widened. There are over 200 pedestrian streets in central London and traffic restraint schemes have been implemented in several residential areas.

The public transit system provides excellent coverage with a good balance of modes, but the coordination among modes is inferior to that found in Paris and Munich. The London Rail Advisory Committee has not been afforded an authority equivalent to that of

Munich's MVV or Paris' STP, and British Rail, which is nationally controlled, and London Transport, which is controlled by the GLC, follow different fare policies. There is no unified fare system as in Paris and Munich and few transfer priviledges exist between modes. Due to serious financial difficulties, the Underground system is being expanded at a slow rate and there are no plans to link the various branches of the commuter rail network. LT and BR services are not accessible to the seriously handicapped.

Greater London has been able to achieve a high degree of coordination between land use and transportation since the planning for both is handled by the same department within the GLC. One of the most interesting examples of this concept is the Hammersmith Center mixed use development project that includes housing, employment, shopping, pedestrian ways, a rearranged road system and parking facilities. At its core is a major joint development project on land owned by the LTE. The new bus garage, bus terminal and Underground station improvements are being paid for by the office and entertainment facilities being constructed above.

The Barbican is a 63 acre residential development area built to significantly increase the population living in the City of London. The pedestrian and living areas were constructed above the road surface and are connected by elevated walkways to offices and shops. Public transportation is provided by two Underground stations and several bus routes.

11.1 Introduction

London is made up of thirty-two boroughs plus the City of London covering an area of 610 square miles (1,580 square kilometers). At its broadest point it is 34 miles across and 27 miles from north to south. Some seven million people live in this area, and many thousands more come into it every day to work, shop or take part in leisure activities. It is the seat of government and parliament, a national and international financial, commercial and cultural center, and the home of most of the major national institutions.

Greater London consists of three concentric rings. A central area provides the main focus of employment and commerce for London and the south-east region of England and houses the nation's government and financial institutions. An inner ring consists largely of 19th century housing and industry. An outer ring was developed mostly in the twentieth century around older previously free-standing towns. These older centers and some parts of inner London are envisaged as providing strategic shopping and employment modes to counteract the attraction of central London. The metropolitan area is surrounded by a green belt designed as a buffer to further development and as open space for London. Beyond this lies the remainder of the south-east region, much of which is also dependent on London for employment.

Greater London's population, particularly in the inner area, has been declining steadily over the years, but this has been offset by an increase in population in the remainder of south-east England. Employment has also fallen and is currently declining at a rate of 2% per annum (just over 1% for central London).

The road system consists of a few high standard divided highways and radial freeways entering outer London and a ring road (a broad city road) around inner London. A new circular freeway is currently being built around Greater London, but plans to build other ring roads or radial freeways have largely been abandoned.

London's public transport system is characterized by dense rail and bus networks. London Transport underground lines, mainly serving north London, and British Rail surface lines with a particularly dense suburban network in south London radiate from the central area. Bus routes radiate from central London but also focus on outer town centers and mainline train stations. Over 90% of work trips to central London are made by public transit. Yet, due to through traffic and the high level of activity and population density, the central area is congested during the entire working day. The outer areas are less densely developed, experience fewer congestion problems, are less well served by public transportation and are more car dominated.

In London there are four basic transportation themes of interest:

(i) restraint of road traffic;

(ii) traffic management - improvement of the road system and its operating efficiency;

(iii) provision of a high level of public transit; and

(iv) coordination of land use and transportation development.

11.2 Institutional Arrangements

The government of London is the responsibility of the thirty-two London boroughs, the City of London (the City of Westminster is considered a borough), and the Greater London Council (GLC). These authorities were set up in 1965 as part of a major reorganization of local government.

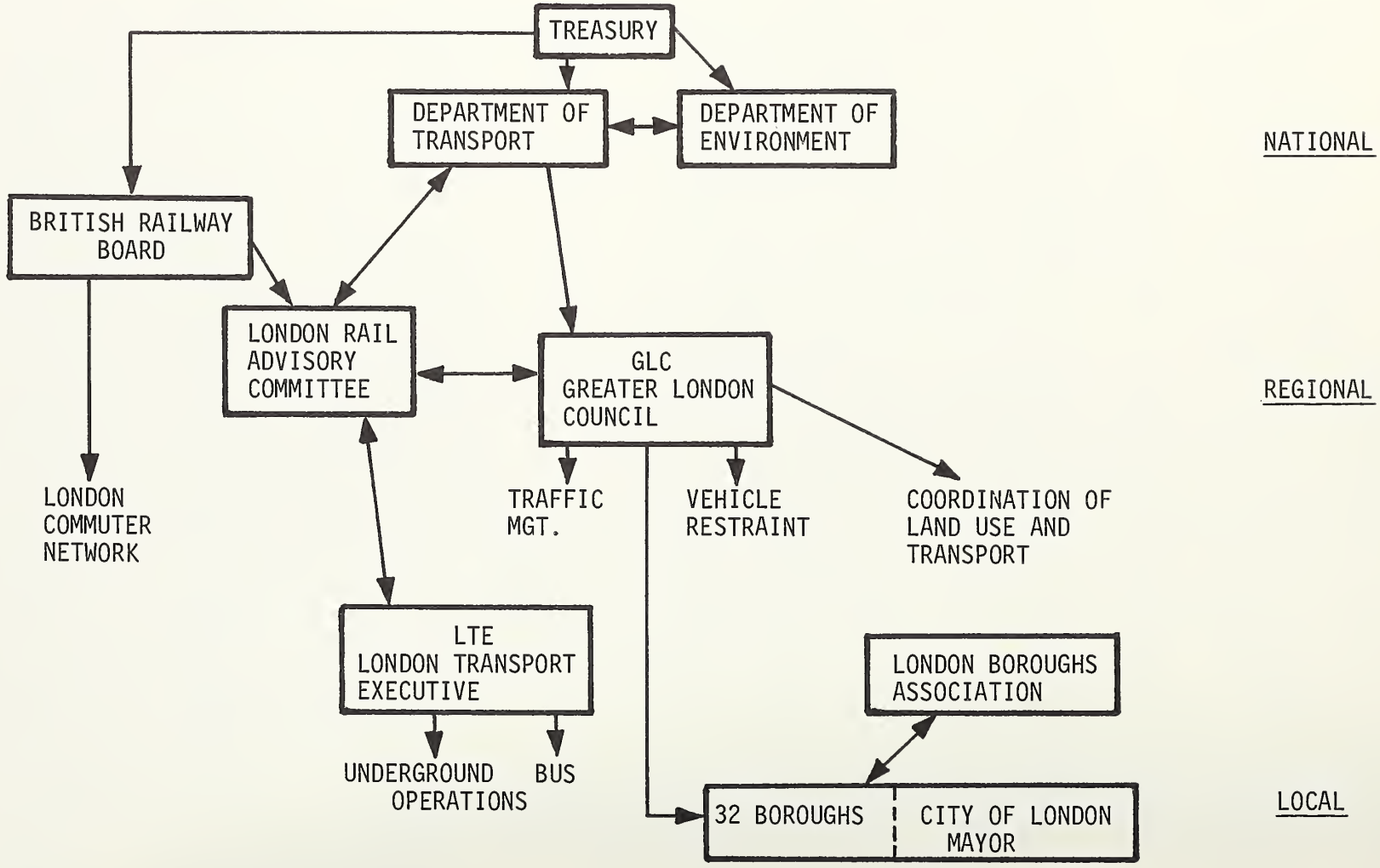
The division of functions in the London government between the GLC and the boroughs was based on three principles: first, the boroughs should be the primary units of local government in London providing the full range of local government services; second, the GLC should be responsible for those functions which need to be dealt with by one authority over the whole of Greater London; third, the respective responsibilities of the GLC and the boroughs should be as separate and distinct as possible in order to avoid overlapping and duplication. As a result, the boroughs and the GLC are fully autonomous bodies, each responsible to the national government and to the local electorate for carrying out the services they are to provide.

11.2.1 Boroughs

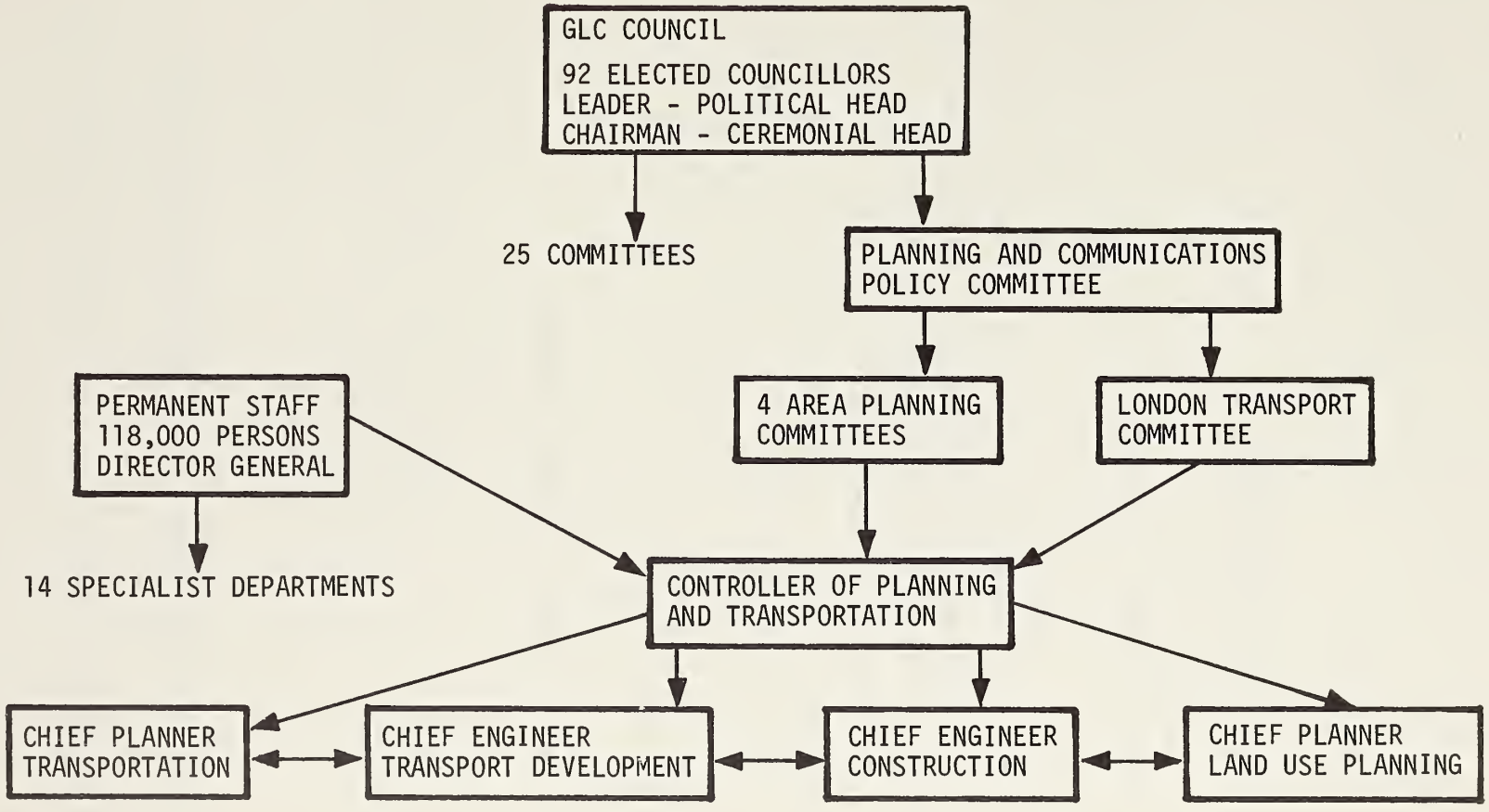
The majority of London boroughs have populations of between 200,000 and 300,000. Each borough is governed by a Council which consists of directly elected Councillors. The number of members on each Council is between 60 and 70. Councillors are elected on a party political basis and the parties act as cohesive groups in Council affairs. Members serve for four years. The Borough Councils appoint committees to manage particular aspects of their work.

The London Boroughs Association (LBA) was formed in June 1964 to be a forum in which the London boroughs could discuss common problems, to provide machinery through which the

LONDON INSTITUTIONAL STRUCTURE



GREATER LONDON COUNCIL



boroughs could coordinate their activities, and to enable them to express their common views to the national government, the GLC and other bodies. Thus, the LBA is the strategic arm of borough government.

11.2.2 City of London

Historically, the walled City of London, a mere mile square, was the whole of London with its own Lord Mayor and Common Council. The national government was located at Westminster and the Royal Family at Buckingham Palace. The City of London and its government exist under the same form today, although the GLC has taken over many municipal functions such as fire, sewage, water and public transportation. The City of London has maintained its own police force. The Lord Mayor is elected annually and is the civic head of the City of London. When the Chairman of the GLC visits the City of London, he does so as guest of the Lord Mayor, and it is the Lord Mayor who receives heads of state visiting the City and who is the City's representative to the Queen.

11.2.3 Greater London Council

The GLC's business is conducted by 92 elected councillors. The councillors are elected for four years and retire together. Each represents an electoral area the same as the Parliamentary electoral area. Members of the Council are not paid.

The Council operates on party political lines and the Leader of the Council is its political head. The Leader is elected by the members of the party that has a majority in the Council after the four-yearly election. He holds office for one year but can be re-elected so long as he retains the support of his party.

Most of the Council's day-to-day decision making is undertaken by committees acting on behalf of the Council. Committees are appointed annually by the Council from amongst their membership; the members appointed vary from six to 37 in number, with party political representation reflecting the composition of the whole Council. There are at the moment 25 committees of the Council. It is the Planning and Communications Committee, along with its seven sub-committees, that is charged with the region's strategic land use and transportation planning.

In order to advise the members of the Council in their enormous task of running Greater London and to carry out the Council's decisions, the GLC employs a permanent staff of about 118,000. These staff are independent of the party political organizations and are instructed by the Members working through Council committees or the Council. The permanent staff, headed by the Director-General, the Council's chief executive, are organized into 14 specialist departments. Each department, directed by a chief officer, has its own internal management structure but works within a system of corporate management by which some departments are grouped together under the supervision of a Controller.

There are four departments under the Controller of Planning and Transportation: Transportation Planning; Transportation Development (responsible for all traffic management schemes); Transportation Construction; and Land Use Planning.

11.2.4 Division of Transportation Responsibilities in London

The majority of London's transportation planning and coordination takes place at the GLC which was charged by the Transport Act of 1969 to develop policies and measures which

will promote integrated, efficient and economic transport for Greater London. The integration of all transport and land use planning policies was assured by putting both these functions under the same department within the Council.

As the overall planning authority for Greater London, the GLC's planning and transport functions are primarily strategic in nature. The GLC has produced a strategic land use and transportation plan for London, the Greater London Development Plan (GLDP). In conformity with this overall plan, the boroughs are responsible for drawing up development plans for their own area. The boroughs have powers to carry out development schemes, either on their own initiative or in partnership with private enterprise. All applications for planning permission must be made to the local borough council, which has power to decide on all but those having significant strategic implications, which are dealt with by the GLC - for example, the erection of an exhibition center, a concert hall or a sports stadium, a railway station or an airport, a building forming part of a university.

The GLC is responsible for the construction and maintenance of all main roads (except trunk roads) and is the overall traffic authority. On the other hand, the boroughs are responsible for the construction, maintenance and lighting of roads other than metropolitan and trunk roads (about 6,800 miles). They devise and operate on-street parking schemes (which have to be approved by the GLC) and may also provide off-street car parking facilities. They provide and maintain traffic signs (other than those put up in connection with traffic management schemes), road markings, pedestrian crossings, etc. on roads other than metropolitan and trunk roads and carry out for the GLC works on traffic management schemes.

The Transport Act of 1969 also created the London Transport Executive (LTE) which operates and manages all London transit services (Underground and red buses), leaving overall strategy and planning control in the hands of the GLC. The GLC dispenses part of the central government block grant to the LTE and has the power to make grants to British Rail (BR) which runs commuter train services into Greater London.

The London Rail Advisory Committee was set up as a means to coordinate British Rail's regional services with the rest of the area's transportation activities. It provides a forum for the DTp, BR, LTE and GLC to guide the preparation and implementation of transport plans. The boroughs are consulted by London Transport on proposals affecting services in their areas, and, through the London Boroughs Association, they are represented on the consultative London Transport Passengers Committee.

11.2.5 National

The Department of Transport (DTp) oversees all national transportation policy but leaves urban transportation policy decision making to the local authorities. Until 1976 the DTp was a ministry within the Department of Environment. Today, the two units continue to work closely together, predominantly in the coordination of environmental and land use policies with transportation policy. Within the DTp are concentrated all central government statutory powers, budgeting control and political decision making in the sector. The DTp provides capital financing for British Rail, infrastructure grants to both British Rail and London Transport and revenue grants to British Rail for non-remunerative services. It also provides block grants to regional governments covering almost all facets of transport expenditure.

11.2.6 Funding and Revenue Sources

The GLC obtains revenues for transportation activities from two sources - a portion of the property tax (called "rates") collected by each borough and a block grant from the national government. The GLC submits a Transport Policies and Program (TPP) to the DTp which includes a general policy statement, a five-year program and an annual review. The TPP is a unified grants system similar to the American TIP and is the basis for all central government funding. It covers all road building, maintenance, traffic management and public transport implementation and operational schemes.

The GLC planning staff prepares the TPP with the funding requests from the boroughs in mind. All funding is made on a block grant basis and not earmarked for special projects. The GLC dispenses the central government regional block grant to the Greater London boroughs as well as to the London Transport Executive and to British Rail.

Monies for the grant are raised through the income tax and other taxes, such as gasoline and vehicle licenses (both of which are not necessarily earmarked for transportation purposes). The proportion of tax monies going to transportation is determined by national policy.

11.3 Restraint of Road Traffic

The main areas where the GLC seeks to impose restraint are the 100 sq. km. (40 sq. mile) Inner London Parking Area (ILPA) in Central London and 24 strategic centers outside this area which experience congestion. There are five objectives associated with this vehicle restraint: to improve bus operations; the environment and pedestrian conditions, reduce fuel consumption and increase vehicle speed.

11.3.1 Parking Controls

Vehicle restraint is imposed at present by five types of parking controls: (i) the introduction and modification of controlled parking zones (CPZ's) for on-street parking; (ii) controls on the provision of new general use parking lots and garages (GPL's); (iii) similar controls on the continued use of existing temporary GPL's; (iv) controls on the operation of GPL's; and (v) controls on the provision of new parking facilities for private use. However, the GLC has no powers to control the use made of existing parking facilities for private use.

On-street controls, generally meters permitting parking from two to four hours, are designed and implemented by the London boroughs, the GLC being responsible for the legal process which includes advertising and satisfying all criticism. In most CPZ's separate provision is made for residents to park in special residents' bays provided that they display a permit purchased from the borough for between $1.00 and $70 per annum. Enforcement has posed a major problem with on-street control. Central government price controls depressed parking meter and violation charges, maintenance costs of meters are high and the towing program is small. As a result, traffic wardens do not even earn their salaries, except in the City of Westminster.

The GLC is able to direct the boroughs to refuse an application for the development of general use parking lots and garages with over 50 spaces. The GLC's policy has been to refuse permission for all GPL's in the ILPA unless it can be shown that they would provide for a need which cannot be met by public transport or by more efficient use of existing GPL's. The same approach is taken concerning the renewal of temporary sites. At the request of the GLC most borough-owned parking facilities impose charging structures in which the long term parker pays

no less per hour than the short term parkers. Also, at the request of the GLC, all boroughs within the ILPA have adopted restrictive standards for parking provision of parking facilities associated with new developments (one space per 12,000 sq. ft. of office and shop development in Central London and 8,000 sq. ft. in the rest of the ILPA, compared with a previous minimum of one space per 2,000 sq. ft.).

The following table indicates the changes in non-residential parking space in Central London from 1962 to 1976. On-street space has been reduced by 66%, GPL space has increased by 17% and private non-residential parking space has increased by 28%. As a result, total non-residential supply has fallen by 18% over the 14 year period. However, the total number of vehicles parked in non-residential spaces at 10 a.m. in Central London has not changed. People have merely shifted to off-street facilities. It should be noted that many Central London employees have their parking paid for by their employers and that 60% of the cars driven into Central London for work purposes are provided free (including gasoline) by employers.

Non-Residential Parking Space in Central London

Type of Space	1962	1976
Free on-street	48,000	4,000
Metered on-street	10,000	19,000
Public use parking facilities (lots and garages)	24,000	28,000
Total public use parking	82,000	49,000
Private parking facilities, non-residential	40,000	57,000
Total non-residential	122,000	100,000

Parking controls to date appear to have done little to achieve four of the five objectives stated earlier: improvements in bus operations, the environment, and pedestrian conditions and reduced fuel consumption. Parking controls by themselves have neither led to an improvement in bus operating nor a reduction in fuel consumption. While more orderly parking resulting from on-street control has improved the environment and conditions for pedestrians, widespread traffic reductions in environmentally sensitive areas have not been achieved. There also does not appear to have been a significant reduction in accidents.

The one objective which has to some extent been met is that of increased speed for general traffic in Central London which can clearly be attributed to the effects of on-street control. Paradoxically this may have made car use more attractive - particularly to uncontrolled parking spaces and through the area. Total car traffic has increased because the effects of reducing public parking have been overwhelmed by increases in through traffic and parking in both privately operated public-use parking facilities and private-use facilities.

Finally, problems with other aspects of transport policy, particularly recent public transport fare increases, have probably reduced the impact of parking control. (Fares have more than doubled since 1975.)

11.3.2 Area Licensing in Central London

The parking policies described above, as well as the provision of additional car parking at suburban stations, continue to form the basic means of traffic control in London, but the increasing amount of through traffic in the Central Area has been a matter of growing concern over the past few years. In the early/mid seventies two schemes designed to limit through

traffic in the Central Area were examined. The first of these, cordon restraint (imposing delays at traffic lights in a collar between two and four miles deep around Central London), was found to be impractical because of the difficulties of accommodating the vehicle queues associated with it. It was also inefficient in that, even with bus priorities, it produced a net loss to the community.

The other scheme, Supplementary Licensing, envisaged the control of traffic in the Central Area through a licence costing about £2 ($4) required for a vehicle to travel in the area between 8 a.m. and 6 p.m. on weekdays. It was estimated that the scheme would have reduced Central Area traffic by a third, would have been economically efficient and would have yielded substantial public revenue. However, it was felt to be too difficult to enforce adequately and would be likely to lead to hardship amongst low income car owners who had to use their cars in the Central Area.

More recently, the possibility of a scheme which would not exhibit these weaknesses has been examined. The resulting Area Control Scheme is different in several respects from the original Supplementary Licensing Scheme and, to some extent, overcomes the objections to the original scheme. Its essential features include:

(i) a relatively small control area (15 sq. km./6 sq. miles);
(ii) a low charge ($1 per day; daily or monthly pass);
(iii) control on inbound traffic at cordon;
(iv) cordon enforcement;
(v) exclusion of goods vehicles from the scheme;
(vi) other selective exclusions and concessions;
(vii) high diversion of through traffic and low restraint of Central Area bound traffic.

Since the difficulty of enforcement was one of the main objections to the Supplementary Licensing Scheme, a boundary was chosen which minimized the enforcement problem. The River Thames was selected as the southernmost boundary so that for this 5 km. section enforcement could be exclusively confined to the eight road bridges. Most minor roads into the area are to be closed (made one-way out of the area) and signs will be erected warning motorists that they are approaching the control zone. Virtually 100% compliance is required for the plan to operate well since sufficient staff and car storage areas do not exist for apprehending large numbers of violators.

The responsiveness of traffic to a special charge for entering the control area proved to be one of the most difficult effects to estimate. The differences between through and terminating traffic, vehicles using free and paid for parking and journeys financed out of households' and firms' budgets were all known to be significant, but impossible to predict accurately. As such it was only possible to predict the charges necessary to reduce vehicle miles in the control area by about one third (estimated to be near the optimum) within a fairly wide range. However, it became clear during the study that the suggested scheme would have much greater effects on through traffic than for traffic destined for the control area.

The decision to relate control to inbound traffic across the cordon minimizes effects on control area residents, contains the enforcement task, reduces the chance element of enforcement and allows pre-peak commuters, for whom public transport can be inconvenient, to remain unaffected. The exclusion of goods vehicles was designed to shield this aspect of commercial activity from any restrictions on movement. While such an arrangement could encourage excessive through commercial vehicular movement, extension of the existing through truck ban scheme could be used to limit this problem, if necessary.

Considerable thought was given to the possibility of hardship and commercial damage arising from the scheme. The disabled, control area residents, business motoring, low income car users, people who had difficulty using public transport, etc. were all assessed group by group and two concessionary schemes, each fairly easy to administer and enforce, were devised. The first was restrictive and only included those groups for which there was a strong case for concessions. The second was less restrictive and included more groups.

The study confirmed that there were general transport advantages in a simple form of control of traffic levels, affecting both through and terminating movement, in Central London. Moreover, by such a scheme the commercial and economic activities of Central London could be enhanced, public transport improved and its environment improved. However, a scheme of this kind raises many difficult and complex public policy issues and the contribution this kind of transport management technique can make to the improvement of life in contemporary cities has yet to be established.

Legislation would be necessary to institute the scheme, probably a government bill. Following preparation and publication of the details of the scheme, the public would be given a period in which to make its comments known and, perhaps, a public inquiry would be held. This procedure could take up to four years.

11.4 Traffic Management

11.4.1 Purpose and Scope

As a result of high levels of congestion, particularly in Central London delays for buses and commercial vehicles, use of residential side-streets to bypass congestion, environmental disruption and accidents, the GLC has developed a comprehensive traffic management program. The objectives of this program are:

(i) to encourage industry and commerce to remain in and return to inner London, prerequisites of which will be reduced traffic congestion, provision of suitable parking spaces and improved public trans-

port facilities for both the movement of goods and employees;

(ii) to improve bus reliability, a prerequisite for which is a reduction in delays caused by traffic congestion;

(iii) to improve the environment in certain areas by controlling trucks and rerouting through traffic back onto main roads more suited to it;

(iv) to improve facilities for pedestrians, especially at intersections, and reduce pedestrian accidents and promote road safety generally;

(v) to provide, where appropriate, safer conditions for the use of bicycles;

(vi) to improve the journey times of those who have the greatest need, and to make more efficient use of road space by controlling the less essential and less efficient road users;

(vii) to reduce the total resources costs to the community of providing and using London's transport system.

The traffic management policy has resulted in the following implementations: traditional measures such as one-way streets, on-street parking restrictions (discussed in Section 11.3.1), traffic channelization, and computerized traffic signal control; black spot accident reporting; bus lanes; bus-only streets; pedestrian streets; truck bans and truck routings; and traffic restraint schemes to protect residential environments. In order to maximize mobility, a balance between public and private transportation is sought.

11.4.2 Traffic Management Experiments

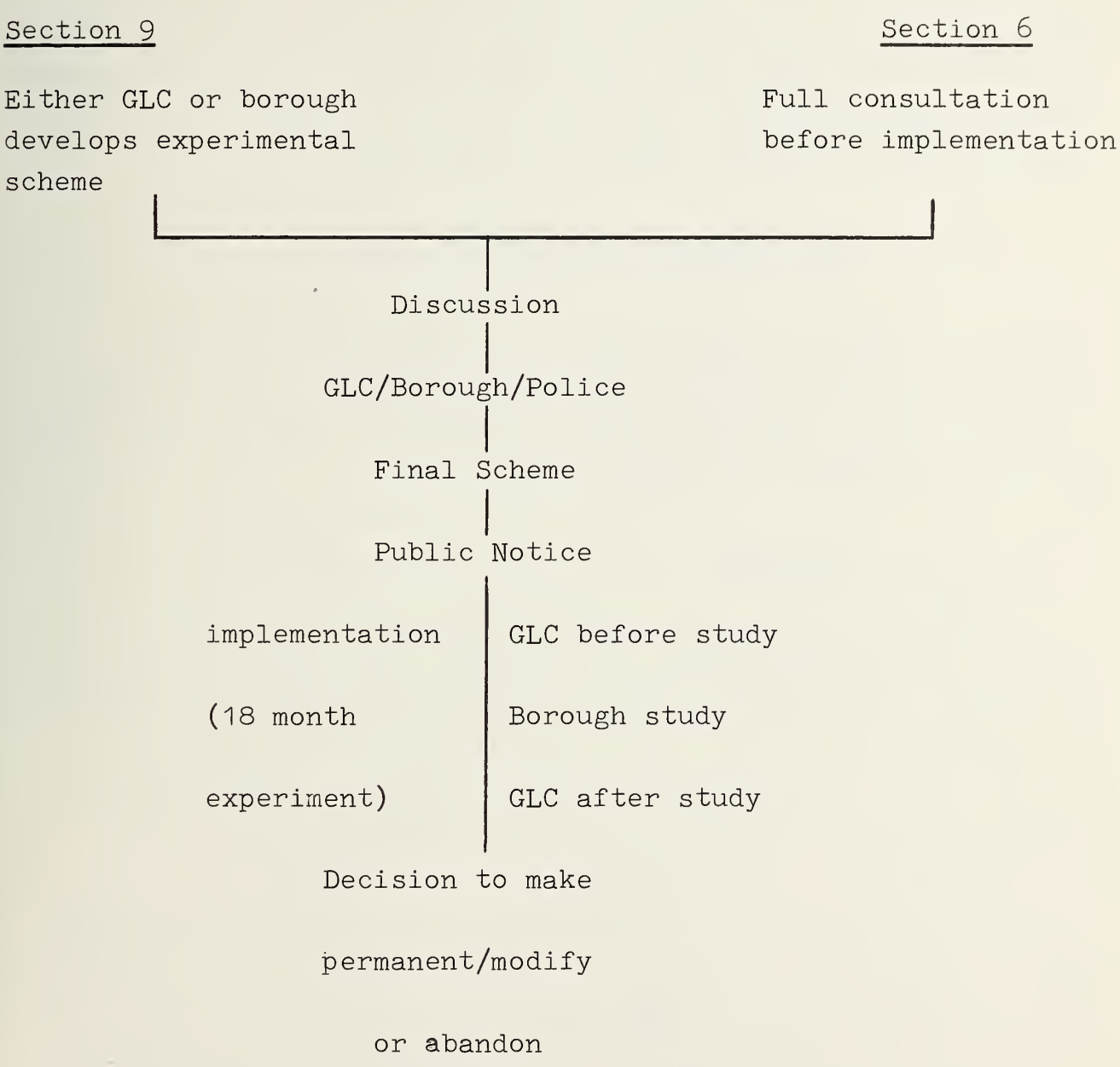
Section 9 of the Road Traffic Regulation Act of 1967 made it relatively easy for the GLC to implement traffic management schemes on an experimental basis. Either a borough or the GLC may take the initiative in developing an experimental scheme. The scheme is discussed with the non-proposing unit and the police, a final scheme is agreed upon, public notice is given and an 18-month experiment is begun. Public participation is not actively sought. Before and after studies are conducted by the GLC and the borough also conducts a study. Typically, the only objections to the scheme arise from persons in adjoining boroughs. The GLC decision whether to make the experiment permanent includes the public's view, but there is no formal public participation process.

The alternative to the Section 9 experimental implementation is defined in Section 6 of the Act which requires full consultation before implementation, resulting in a lengthy process. Part of the increase in congestion on the ring road is due to the frequent use of the Section 9 procedure (the GLC prepares 600 legal papers each year on traffic management changes). As a result, GLC politicians are recommending that the Section 6 procedure be used more frequently as a means to slow the implementation of some of these schemes.

11.4.3 Traditional Traffic Management Techniques

Traffic management became essential in the early 1960's due to a doubling of the car population during the previous decade. At first traditional measures were attempted - one-way streets, on-street parking restrictions, traffic channelization and traffic signals. Flows and speeds improved until the mid 1960's when, again, a critical point was reached. In 1973 an experiment in area traffic control was implemented at 70

Road Traffic Regulation Act of 1967



critical intersections in West Central London. The experiment was successful in improving flows and speed and today in Greater London there are over 1,900 signalized intersections, 800 of which (300 in Central and 500 in Inner London) are considered close enough to each other to form a coordinated system. Almost all of the 800 signals are under the control of the GLC's program COMPRESS which optimizes traffic flow. The system does not give priority to buses since they are too numerous.

11.4.4 Black Spot Accident Reporting

London has a very successful "black spots" computerized accident reporting scheme. Where accidents are found to be higher than normal, small scale remedial changes such as new striping, tree cutting, or signal changes are made. This is done at about 200 points per year.

11.4.5 Bus Lanes

The GLC policy is to give an advantage to surface public transit over the automobile in order to encourage a modal shift from auto. The justification is that transit provides a greater total net social benefit (when considering transportation externalities such as air and noise pollution, energy and land use) at a lower cost than the private automobile.

The primary means for doing this is the bus lane program which began in 1968 as a relatively inexpensive and quickly implementable measure to improve transit level of service. Most new bus lanes are introduced on an experimental basis under Section 9 but are normally so well designed that evaluation more often leads to modification than removal. Bus lanes are implemented where over thirty-five buses per hour use the route.

Line haul trips are well served by British Rail and the Underground while buses are used primarily as feeders to rail modes or haulers in low density situations. The average bus journey is only two miles long compared to 16 miles on British Rail and 5 miles on the Underground. As a result the average length of bus lanes is only about 300 meters with most applications being queue jumps. No long distance bus priorities exist. Today there are 150 bus lanes in operation over 26 miles of bus routes. Almost all are with-flow curb lanes. Few opportunities exist for enlarging the network.

The reserved lane program is felt to have been a success by those involved. The average cost in the early 1970's was $9 per foot. The following table indicates the types of time savings achieved with four with-flow lanes. A study of thirty-one with-flow lanes indicated that times for non-priority vehicles were also reduced by .3 minutes. Contra-flow lanes have been more expensive to install ($35/foot). The 260 foot Tottenham High Road lane has increased bus speed by 33%. Accident rates have not been affected by the bus lanes and there are too many factors involved to isolate their effect on transit patronage.

Table: With-Flow Bus Lane Results

	Length (ft)	Bus Volumes (buses/hours)	Effects on Buses
Brixton Road	106	100	2 mins. saved
Vauxhall Bridge	225	60	7 mins. saved
Park Lane	55	140	.5 min. saved
Westminster Bridge Road	43	60	.75 min.

11.4.6 Transit Malls

A scheme that is considered most significant as a bus priority measure is the Oxford Street bus and taxi precinct.* The scheme is 1.6 kilometers (1 mile) long and operates Monday through Saturday from 8 a.m. to 7 p.m. Only buses, taxis, cycles and emergency vehicles may use the street in its entire length. Delivery vehicles and cars may only use the street for access over short stretches and are restricted to these areas by required turns. The traffic flow was also reduced from four to two lanes and the gained area resurfaced for pedestrian use. This scheme is thus far the only one of its kind in London. It was paid for by the GLC at a cost of £500,000 ($1 million in 1972 - 1975 dollars). Eighty per cent of the cost was for temporary paving, traffic signals and signing, while 20% was for permanent paving.

Oxford Street is London's busiest shopping street. With traffic flows of up to 3,000 vehicles per hour, there were, prior to conversion, ten times as many accidents as on the average main road in London. With this in mind, the objectives of the bus and taxi precinct were to improve bus speeds and reliability, the pedestrian environment and road safety.

Opposition to the scheme was related mainly to the diversion of traffic onto neighboring streets. To reduce resistance to the project and to insure its successful implementation, an extensive public information program was initiated in July 1972.

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* This section has been excerpted from F. Britton and C. Feibel, TSM in Europe: The Research Results, London Case Study, Ecoplan, Paris, May 1978.

Four months later, on a Section 9 experimental basis, the road was restricted to buses, taxis and service vehicles over half of the length of the proposed project, first in one direction and one month later in both directions. Eight months later (July 1973) the public was informed of the second half of the project and eight months after that it was implemented (March 1974). Permanent alternations to the street were made during 1975.

As a result of the project, extra signals were installed at twenty intersections, signals in the area were retimed, 200 new traffic signs were erected, and sixty-five parking spaces were removed. In 1975 the sidewalks were widened and the previously four-lane road permanently converted into a two-lane road. Benches and cross-walks were provided to improve the pedestrian ambiance.

When traffic in the area (within one kilometer of Oxford Street) reached "steady state", travel time had been reduced by three-fourths of previous high values. Traffic on Oxford Street dropped 50% during hours of implementation and 42% in the morning before the hours of operation. It is estimated that 35% of the previous vehicular traffic in Oxford Street had left the area completely. A survey of residents and shops managers in the area indicated 85% thought the scheme successful.

As to the effect on accident rates, there has not been a substantial reduction; however, the accidents that have taken place have tended to be less severe. The effects on public transport have been more encouraging, with routes passing through Oxford Street saving one to two minutes for transit riders over half the length of the scheme. Also a reduction of 50% has been observed in the variability of journey times in the area thus improving operating efficiencies and reducing waiting times. For pedestrian crossings at a test point, the average duration of gaps in traffic doubled.

The overall ambient noise level of Oxford Street was reduced 2dB, although not during the rush hours. Carbon monoxide levels were down from 17 to 4 ppm and smoke from 370 to 180 micrograms/m^3. At sites on roads with diverted new traffic, noise levels sometimes went 3 to 4 dB higher, CO levels rose from 18 to 24 ppm and smoke levels remained the same. Enforcement has been a problem, but increased surveillance by police and traffic wardens have made significant improvements in this area.

11.4.7 Pedestrian Streets and Ways

The GLC is currently studying the feasibility of linking up many of London's pedestrian streets and ways, parks, squares and open spaces. For historical reasons the central area of London is the place where most pedestrian streets and ways occur; it has also been the focus for creating most of the new pedestrian streets. There are currently over 200 such localities in the central area.

The public authority pays for street pedestrianization. If property and rental values increase, these increases are reflected in the tax structure. Pedestrianization of already principal shopping streets has led to increased shopping activities and increased rents. The pedestrianization of S. Molton Street in Mayfair has resulted in a multiple-fold increase in rents and expensive boutiques and restaurants have replaced the former small shops. In less favored areas the pedestrian streets with a significant proportion of shops seldom give evidence of particular popularity with shoppers, principally because they lie off the beaten track. This merely serves to illustrate that pedestrianization alone is not going to change the habits of walkers and shoppers unless the pedestrian street: offers a particular attraction, like Carnaby Street; lies on a natural route favored by office workers, shoppers or residents,

Pedestrian Areas in London

like the Arches at Charing Cross; or serves as a short cut between two locations generating and attracting people, as does St. Christopher's Place.

Before pedestrianization of the Carnaby Street area, 28,000 pedestrians were counted between 8 a.m. and 9 p.m. After the change the number increased by 36% to 38,000. A study one year later showed the number to have increased again. Vehicle flows on local roads within the area decreased, while flows on certain main roads increased by 10%. A survey showed that over 96% of the pedestrians approved of the scheme, giving reasons of safety, pleasantness, ease of window shopping, and freedom from vehicle noise and fumes.

Experience has demonstrated that, providing the local community can be persuaded to accept a measure of inconvenience and some limited environmental disbenefit in the immediate locality of the scheme, it is quite feasible to devise pedestrian streets and small precincts without elaborate road improvements. It is also desirable to think in terms of area improvement rather than of a single street alone.

11.4.8 Truck Policies

The GLC has developed a comprehensive freight policy that, on the one hand, restricts the use of trucks but, on the other hand, facilitates their operation. While road freight is the cause of serious environmental problems, it is also the major element in London's goods movements. The development of a truck route network has been abandoned due to inadequate road capacity and objections by residents along such proposed routes. However, the needs of industry and commerce are given priority in the improvement and management of roads, and a network of key routes is being improved.

Large scale restrictions on access are thought to be damaging to London's economy and are not being pursued, but restrictions are being applied locally. Overnight truck parking bans are being introduced by boroughs in most of London with GLC support. Local bans on through operation of large trucks are also being introduced on the same basis. In the Central Area a through ban on vehicles over 40 feet in length has proven successful, and there is a ban on deliveries during peak periods on 130 miles of roadway.

Several large department stores located in the city center have set up "break depots" in the outskirts of London which permit them to consolidate shipments to particular stores. They have found that this improves their operating efficiency since only one truck is unloaded instead of many throughout the day. The GLC has been promoting this option among other large retailing operations.

The GLC is assisting companies in finding warehouse sites located near major routes and is supporting the introduction of large freight complexes. GLC policy is that London should accommodate warehousing and depots when over 60% of the goods relate to London in order to minimize truck mileage and provide employment. The GLC has also proposed the construction of cooperative depots for small haulers to encourage consolidation of freight shipments.

New standards for the noise levels and other environmental aspects of truck design are being pressed on the British Government. The Department of Industry and the GLC are sponsoring the introduction of a pilot fleet of battery powered goods vehicles.

11.4.9 Traffic Restraint in Residential Areas

11.4.9.1 Environmental Area Planning

London has developed the concept of environmental area planning in which all environmental aspects of a new traffic management scheme, as well as its relation to other public policy, are considered during development. This is particularly true when designing traffic restraint schemes in residential areas since the displaced traffic often has negative environmental effects on activities along diversion routes. As a result, recent residential area schemes have been compromises on original plans.

11.4.9.2 Barnsbury

Barnsbury is an example that succumbed to these environmental concerns. In the early 1960's the Barnsbury section of the London Borough of Islington was a declining neighborhood of 18th and 19th century Georgian houses. In 1965 a local residents' group, the Barnsbury Association, raised the issue that the piecemeal redevelopment of the area that had been occurring was contrary to good coordinated planning. As a result, the GLC and Islington completed a study of the area, in consultation with the Barnsbury Association. A traffic management scheme was prepared and an experimental scheme was implemented in 1970. The scheme severely restricted traffic flow through the area, diverting all through traffic to the bordering streets.

As time went on a large public sentiment was organized against the plan. The peripheral roads were totally unsuitable to accommodate the diverted traffic. The restraint area was too large and had shifted the traffic burden and the accompanying noise, dirt, vibration and unsafe environment from one set of roads to another. There was a lack of understanding of the scheme and why it was implemented, and people complained about

the poor accessibility, longer journey times and difficulty in understanding the routing possibilities.

Before the scheme had been implemented, Barnsbury's real problems had been social and housing, not environmental. The scheme merely exacerbated these problems by encouraging gentrification, dividing the community and increasing land speculation. The first remedial change was to partition the large environmental area into smaller traffic cells by allowing through roads, with narrow collars to restrict trucks. A second set of modifications put in control signs allowing through traffic to use certain streets only during peak hours. Since these regulations have not been enforced, the area has, for all intents and purposes, returned to its pre-scheme configuration.

11.4.9.3 Pimlico

An older restraint scheme which has been highly successful can be found in Pimlico, a district in the southern portion of the London City of Westminster comprised primarily of three storey mid-Victorian houses built between 1850 and 1870. Public open space is minimal. The street layout is generally a grid pattern and many of the streets are arranged so that they form convenient short-cuts for traffic travelling from the south-west to the Parliament Square and Victoria areas.

As a result of this through traffic, an area of nearly 30 acres was included in a vehicle restraint scheme. Entry into the area was prohibited at all but four points through the use of one-way streets. The entries were one-way streets arranged diametrically opposite each other so as to make it impractical for any vehicle to be driven in a straight line through the area. In order to improve pedestrian safety as well as provide space for trees and benches, sidewalks were widened at all

entry points leaving only enough roadwidth for traffic flow. The total cost for the scheme, which was implemented in 1967, was £39,000 (about $110,000 in 1967 dollars).

Traffic counts before the scheme was implemented showed that peripheral roads were not being used to full capacity. The plan successfully eliminated through trips and only minor statistically insignificant increases occurred on peripheral roads, indicating that people formerly using the short-cuts switched to a different route entirely. Accident levels remained the same on peripheral roads but declined significantly (from 11 to one during the measured period), within the precinct.

11.5 Public Transit

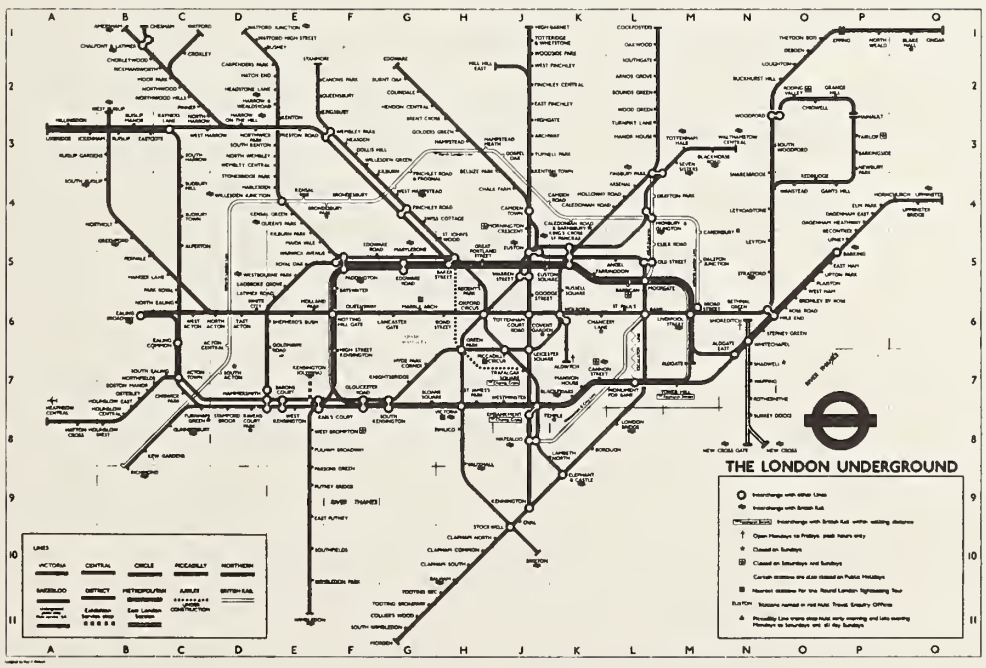
11.5.1 System Description

Public transportation in London includes commuter railroad, rapid raid (the Underground) and bus. The Underground and red buses are operated by the London Transport Executive while British Rail operates the commuter railroad. There is also a central government owned rural bus service with some routes entering Greater London.

The British Rail commuter network includes approximately 830 stations, 2,000 route miles and 7,000 vehicles. Four thousand vehicles operate over the eight Underground lines (255 miles in length) that serve primarily central and northern London. The 1,000 single decker and 5,800 double decker red buses operate along 4,000 route miles.

London boroughs

London Boroughs



London Underground

11.5.2 System Complimentation and Coordination

The three modes serve to complement each other: the commuter rail system provides a rapid service for long distance trips; the Underground, with an average length of 5 miles, acts as both a high speed line haul service for intermediate length trips and a central area distributor; and the bus system, on which the average trip length is 2 miles, acts as a feeder to the other modes and is the primary means of public transit in the outer ring. There is also a Red Arrow bus service that provides stand-up shuttle service from London rail stations to major activity modes in the center of the city.

While the three modes form an excellent balance in transportation supply, the fact that they are controlled by two different authorities has precluded the degree of coordination found in Paris and Munich. The London Rail Advisory Committee, which brings together representatives from British Rail, London Transport, the Department of Transport and the GLC, is not an executive force and cannot decide policy. Thus, it has not led to significant changes in operating procedures. The commuter rail service terminates at stations surrounding the central area and there are no plans to connect these lines through intra-city extensions.

Since there is, at present, no global fare policy, a British Rail commuter must purchase an additional ticket to transfer to Underground or bus. Similarly, while a monthly bus and Underground pass is available, in most instances bus and Underground tickets are not purchased together.

Bus and Underground fares increase at a decreasing rate as journey length increases, and this non-integrated fare policy has resulted in a large jump in the fare each time a transfer occurs. Consequently, many travellers have been noted to make

inefficient journeys from the point of view of total time spent travelling (e.g., they will stay on a commuter train rather than change to the Underground resulting in a longer walk to their final destination). The LTE has submitted a proposal to the GLC for an automatic fare collection system compatible with that which British Rail proposed to adopt for the commuter network. This could permit more fare coordination between the two rail modes.

11.5.3 Subsidies and the LTE Fare Policy

The subsidy policies for the nationally controlled British Rail commuter network and for the GLC controlled LTE are dependent upon the party or parties in power. During the past several years national government has been Labor controlled and the policy has been to keep subsidies constant in real terms. By contrast, the GLC, dominated by the Conservative Party, has followed a policy of reduced transport subsidies and higher fares. As a result, there has been no coordination of fares between the two transportation providers. **Fares cover 73% of London Transport's operating costs, 76% of which are labor costs.**

The GLC decides the size of the subsidy it will provide London Transport and it is up to the LTE to work out an appropriate fare schedule and level of service. The LTE policy has been to maximize social benefit, defined as the maximization of passenger miles. This is accomplished through a trade-off of level of service and fare charges made in the context of known demand elasticities. Several examples help to illustrate this policy. While the Underground is cheaper to operate than the bus system on a passenger mile basis, it offers a much higher level of service. Therefore, the Underground fare is set higher than that for an equivalent bus journey (unless the bus journey requires a transfer, in which case its cost will be higher). Since fare elasticities are high for short trips (i.e. people will choose to walk if the price is too high) and since 70% of bus trips

are less than two miles in length, bus fares are kept low to maintain ridership. Underground fares vary from $.20 for a one mile trip to $1.20 for a 21 mile trip and up to $2.80 for longer journeys outside Greater London. Bus fares begin at $.16 for a one mile trip and are $.65 for a trip of five miles or more. Less expensive off-peak round trip tickets are available to encourage this market and the elderly receive a reduced rate on the Underground after 10 a.m. There are 4-day and 7-day tourist tickets available at a relatively high price since these travellers are seen to be insensitive to price. To encourage commuters to use the Underground, point to point tickets on a weekly, monthly, and yearly basis are available at a reduced rate.

11.5.4 Improvements in Transit Level of Service

Sections L.4.5 (Bus Lanes) and 11.4.6 (Transit Malls) described the traffic management schemes that have led to improvements in bus level of service. On the rail side, LT is gradually extending the Underground network to provide increased access and relieve overly-congested segments. The 14 mile Victoria line was opened in sections between 1968 and 1972. In 1977 work was completed on the Piccadilly line extension to Heathrow airport. The three and a half miles of new line including three new stations cost $60 million. Half the cost of the extension was met by London Transport, 25% by the national government and 25% by the GLC. Work is in progress on a segment of the new Jubilee line from Baker Street to Charing Cross.

11.5.5 Transportation for the H and E

The LTE and the GLC feel that the Underground system is basically unsuitable for use by the very seriously handicapped, such as those confined to wheelchairs, who would present many special and difficult problems for other passengers as well as

themselves, particularly in the deep-level tubes. Most stations do not have elevators. Accompanied wheelchair users, however, can travel between certain surface stations by prior arrangement and the installation of ramps is planned in some places. LT has adopted new station design standards for the less seriously disabled. These include ramps, white colored top and bottom risers on stairs for easy identification, more seating at platform and concourse levels, and handrails beside platform seats and on both sides of staircases, the sides of ramps and inclined passageways. Buses are not equipped with ramps or lifts.

11.6 Coordination of Land Use and Transportation Development

11.6.1 Introduction

The coordination of land use and transportation development is well entrenched in London's institutional arrangements. It has already been noted that planning for land use and planning for transportation are handled by the same department within the GLC. London Transport, under the direct influence of the GLC, has a history of joint development projects. This section discusses three projects involving land use and transport: Hammersmith, Barbican and Bond Street Underground.

11.6.2 Hammersmith

The redevelopment occurring in the commercial center of the London Borough of Hammersmith provides an excellent example of joint development, traffic management and coordinated land use planning on a scale relevant to a medium sized American city. The borough has a population of 165,000 and covers an area of 1,600 hectares. Until the 1950's Hammersmith Broadway was a busy and prosperous shopping and entertainment center. Since then, the area has declined in popularity due to: unpleasant

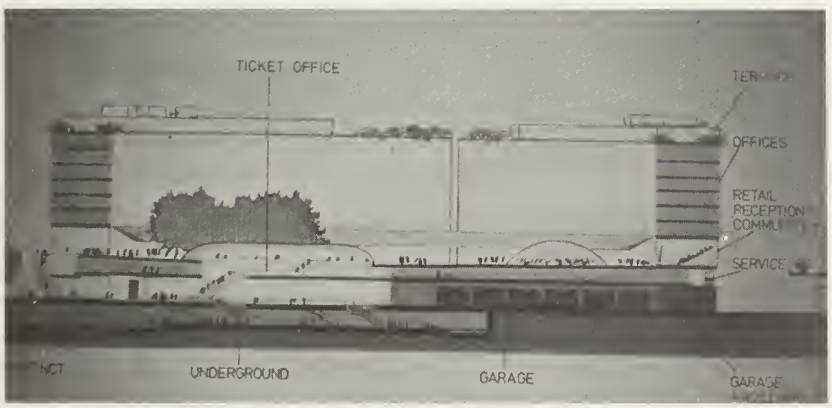
environment, traffic congestion, problems for pedestrians, noise and traffic fumes; a reduction in the population; and competition from other centers that were more accessible by car and had more parking facilities.

The concentration of fifteen London Transport bus routes, seven Greenline bus services, three Underground lines and the passage of inter-city express bus services through the center makes Hammersmith Broadway an important public transport focus with the third highest bus/Underground interchange movement within the London Transport area. Over 12 million passengers use the Underground station every year. However, the present scattered nature of the bus stops with poor pedestrian access to the various parts of the center means that the full potential of the public transport interchange and the public transport service to the center itself is not being realised.

Planning to revitalize the area began in the early 1970's with extensive public consultation: a plan was developed with the following objectives:

- to establish Hammersmith Broadway as a major strategic town center with a wide range of shops, offices and leisure activities;
- to maximize opportunities for local employment;
- to make the center safe, convenient and attractive for pedestrians and motorists; and
- to improve public transport facilities.

Barbican Housing



Hammersmith Joint Development

The plan provides for a mixed use development:

Housing - 223 apartments built above the stores

Employment - 1.5 million square feet of office space

Shopping - 500,000 square feet of shopping being replaced in new accommodations; shopping mall and planned pedestrian street

Pedestrian system - pedestrian zones and walkways to create a coherent system of pedestrian ways across the entire area

Road system - rearrangement of the road system to provide for the improvement in pedestrian facilities and reduce congestion in the road around the center

Parking - construction of a 700 place public garage as part of the new shopping development, intended for off-peak, short-term use, primarily shopping, but also entertainment, recreational and social trips; control of parking as part of the Inner London Parking Area.

The most interesting portions of the plan occur in the area of mass transportation. The Hammersmith Council attaches high priority to the improvement by London Transport of the public transportation facilities in the Center, in particular the provision of a new transport interchange. The nucleus of the area is a six acre island of land containing a ring of old shops along the periphery, the Underground stations, and a bus garage, all surrounded by a heavily travelled circular roadway. Most of the interior space is currently wasted. London Transport, who owns the site, decided it needed a larger bus garage and chose to re-develop the entire site with the revenues generated

from non-transport facilities being used to pay for the transport-related ones - a bus garage, a bus terminal and Underground platform extensions.

The space presents both engineering and architectural difficulties. The Underground tracks are shallow and constructing heavy structures above them would be too costly. Some citizen groups wanted housing, but this was rejected by the Council due to noise and cost considerations. London Transport wanted the development to be self-financing (and, thus, free of GLC controls) and this implied office construction. The first designs called for 600,000 square feet of office space in tall, narrow buildings, but this was rejected by the Hammersmith Council and local citizens as not being in keeping with the scale of the area.

A new design was finally agreed upon and demolition is expected to begin in the Summer of 1979. The development will have offices arranged in a rectangle along the edge of the property with an interior four acre traffic-free public space containing theatres, restaurants and other leisure activities decked over the Underground tracks and the bus garage. Passengers will be able to move conveniently via escalators from Underground, to bus, to public area and to offices.

The public participation process for the Hammersmith project has been active, lengthy and influential. The following summarizes the principal activities:

July - August 1973

A public exhibition of proposals was held for two weeks. It was visited by 4,600 people. A preview of the exhibition was held for the Press and local organisations which resulted in publicity in both London evening papers and the local Press.

An explanatory leaflet was available at the exhibition and subsequently widely circulated throughout the Borough. This asked people to indicate their preference for alternative pedestrian route networks and invited other general comments. Over 650 leaflets were returned and written comments were submitted on a wide variety of topics relating to the planning of the center.

October - November 1973

A series of public meetings were held to discuss the proposals:

1 for the whole Borough - attended by 400 people;

1 each for the north, center and south of the Borough - attended by an average of 40 persons each;

1 for local amenity societies - attended by 40 people.

February 1974

The Council adopted a plan for the area involving an enlarged gyratory road system. Continuing opposition to this by the Hammersmith Society resulted in the Society being invited to prepare an alternative scheme.

January 1975

The Council, together with GLC and LTE considered the Hammersmith Society scheme but found it impractical. The Council agreed to look again at its proposals to see if a new plan could be drawn up to include some of the Society's proposals.

September 1975

A joint Steering Group of LBH/GLC/LTE officers developed proposals for the Town Center, in particular for the revised road options, and the Central Island site. The road schemes were a revised

version of the Council's original proposals for the enlarged gyratory and the new scheme for a shifted gyratory, the latter incorporating elements of the Hammersmith's Society's proposals while meeting GLC and LTE requirements. In September 1975 the Council agreed to consult the public on these proposals, plus options for the Central Island site and certain other sites.

November - December 1975

A public exhibition was held for six weeks in a shop at the main entrance to the District/Piccadilly Underground station. The exhibition was publicised in the local Press and in the Council's newspaper which was distributed free to all households in the Borough. It was also advertised by 150 posters throughout the Borough. The exhibition was visited by 3,950 persons. Preferences for alternative road options and possible uses for other sites were sought by a questionnaire. Sixteen hundred questionnaires were returned and analysed.

Three public meetings were held during this period, in the north, center, and south of the Borough, at which the proposals were explained and discussed. A further meeting was held with local Societies. In all, 150 Societies and many local schools were invited to the discussions. Opinions were received from 12 local organizations and about 100 people attended the three public meetings. The questionnaires, written comments and views expressed at the meetings were recorded and analysed. The results were published in full and reported to the Council.

December 1976

Town Hall exhibition for one week on the options for Bridge Avenue/Angel Walk site. This confirmed the public's view expressed in 1975 that the site should be retained for housing.

October 1977

LTE made a public announcement of its revised intentions for the Central Island site prior to finalizing their planning application for redevelopment. An exhibition for one week plus a public meeting to which local Societies were invited highlighted the main concerns and agreements.

11.6.3 Barbican

A century ago 128,000 people lived within the square mile of the City of London. As a result of commercial building, movement to the suburbs and severe bombing during World War II, the post-War population was only 5,000. Sixty-three acres on the northern edge of the City had been completely bombed and in 1957 the idea of the Barbican, a "living city" where people could live, work and pursue cultural activities, was suggested by the Ministry of Housing and Urban Development and accepted by the City. The resulting development includes three apartment towers and a series of eleven-storey terrace apartment buildings (a total of 2,100 apartments accommodating 6,500 people) grouped around squares, courts and gardens. The entire land area has been used twice in that the pedestrian and living area is completely segregated from the road and parking areas below. Elevated walkways form direct connections to nearby offices and shops.

Two Underground stations are in the Barbican area which is also served by several bus routes. In 1971 the City decided to build an Arts Center in the Barbican, including a theater for the Royal Shakespeare Company, a Concert Hall for the London Symphony Orchestra, a new home for the Guildhall School of Music and Drama and a Conference Center. An art gallery, sculpture court, lending library, restaurants, terraces and gardens are included in the scheme.

11.6.4 Bond Street Station

The Bond Street Underground station (on Oxford Street) is being reconstructed as part of the new Jubilee line development. A portion of the station development will be paid for by the development occurring over the air rights. London Transport is the land owner, and a private developer is building offices and shops above. One of the purposes of the new offices is to free residences in the area that have been converted to offices due to a shortage of supply.

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Appendix I

Summary of Activities of the Organization for Economic Cooperation and Development in the Area of Urban Transportation

Background

The Organization for Economic Cooperation and Development (OECD) is an instrument for intergovernmental cooperation among 24 industrialized countries[1] on matters relevant to economic and social policy. Located in Paris, its basic premises are that: (i) a high degree of international economic interdependence is beneficial for economic growth and social progress; and (ii) intergovernmental cooperation among "like-minded" market-economy industrialized countries can help to solve the problems that they are facing together and those that confront them in their relations to each other and with the outside world. The Organization's activities are geared to two main objectives: (i) to help Member countries promote economic growth, employment and improved standards of living; and (ii) to help promote the sound and harmonious development of the world economy and improve the lot of the developing countries, particularly the poorest.

In 1948 the Organization for European Economic Cooperation (OEED) was established to allocate the $14 billion of Marshall Plan Aid from the United States. This organization served as the predecessor for the OECD which was formed in 1961. By then Europe had achieved a significant economic recovery and the cooperative mechanisms were transposed to stimulating further economic progress in OECD Member countries.

OECD has changed its direction as new needs arose. During the 1960's the main focus of economic policy was on rapid economic growth and the obstacles encountered. In the 1970's more attention has been paid to the quality of life (the Environment Committee was set up in 1970) and energy problems (the International Energy Agency was established in 1974).

The focus of the OECD is the Council, composed of permanent representatives of all 24 Member countries. The Council meets at both ambassadorial and ministerial level and is assisted by specialized committees which cover the environment, macro-economic problems, development cooperation, industry, agriculture, trade, energy, manpower and social affairs, science, education, and various financial and fiscal matters. The committees are composed of national government policy makers. Committees also meet at ministerial level. Many of these committees have expert groups (such as the Environment Committee's Group of Experts on Traffic Policies for the

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[1]Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxemburg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States. Special status to Yugoslavia.

Improvement of the Urban Environment) which undertake more specialized tasks. The Organization is serviced by an international secretariat, a professional staff of experts drawn from 24 Member countries consisting of a permanent staff of international civil servants and specialized consultants.

Environment Directorate

In 1970 the OECD Council created the Environment Directorate. Concern with the environment was linked to a reorientation of government policies from a predominantly quantitative concept of economic growth towards one that included qualitative factors. The Environment Committee has been concerned with chemicals, transfrontier pollution, waste management, water management, energy, air management, state of the environment, urban environment, tourism and the environment, noise abatement, and traffic policies.

In the early 1970's the Environment Directorate launched a program of work to evaluate the effects of policies and programs for traffic limitation and an assessment of costs and effectiveness with emphasis on measures which can be implemented at relatively low cost. Transportation was seen as playing an important positive role in the economic, social, and cultural functioning of cities as well as generating significant economic and social costs due to the external effects of traffic, particularly in terms of noise, air pollution, accidents, consumption of public space, congestion, and disruption of social and economic interactions. A milestone in the Directorate's work was achieved with the 1975 Conference "Better Towns with Less Traffic" at which seven case study cities and seven specialized sessions on such topics as parking, traffic limitation and para-transit were presented.

Group on Traffic Policies and the Urban Environment

Following ths conference, the Group of Experts on Traffic Policies for the Improvement of the Urban Environment was created and has been meeting on a semi-annual basis to further the work in the area of management-oriented urban transport policies. It is made up of delegates from the OECD countries and from the European Economic Community (EEC), the Commission of the European Communities (CEC) which is the secretariat for the EEC, the Council of European Ministers of Transport (CEMT), and the United Nations Environmental Program (UNEP). Some of the Group's major accomplishments have been 12 city case studies, a synthesis report approved by the OECD Council, an overview report concerning evaluation methodology and the publication of the book Managing Public Transport.

Seminar on Urban Transport and the Environment

The 1979 "Seminar on Urban Transport and the Environment" represented another major milestone in the work of the Group. The main objective of holding the Seminar was to consider the policy implications of pioneering efforts to improve the urban environment through the control of unwanted vehicular traffic while maintaining accessibility by an appropriate mix of public and private transport. The former city case studies were updated,[2] new case studies were added[3] and a series of special sessions were planned to explore key areas of interest.[4]

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[2]Besancon, France; Brussels, Belgium; Geneva, Switzerland; Gothenburg, Sweden; Groningen, the Netherlands; London, England; Madison, Wisconsin; Nagoya, Japan; Nottingham, England; Ottawa-Carleton, Canada; Paris, France; and Singapore.

[3]Porto, Portugal; Ankara, Turkey; Osaka, Japan; Curitiba, Brazil; Kuala Lumpur, Malaysia; and Bangkok, Thailand.

[4]Traffic in Residential Areas, Improvements for Pedestrians and Cyclists, Para-transit, Instruments and Incentives for Increasing the Efficiency and Reducing the Environmental Impact of Vehicle Fleets, Pricing Urban Transport, Financing Urban Transport, Short-term Energy Conservation and Transport, and Land Use, the Inner City and Urban Transport.

Appendix II

Summary[5] and Conclusions[6] of the Specialized Sessions at the OECD Seminar on Urban Transport and the Environment

Authors of Reports:
Pedestrians and Cyclists - Michael Taylor
Traffic in Residential Areas - Terence Bendixson and Howard Simkowitz
Paratransit: The European Approach - Alain Rathery
Paratransit in the United States - James Bautz
Regulations and Incentives - Brian Pearce
The Influence of Pricing on Travel Behavior and Modal Choice - Kiran Bhatt
Pricing: Economic Measures for the Coordination of Private and Public Urban Passenger Transport - Herbert Baum and Wolfgang Kentner
Financing: Subsidization of Urban Public Transport - F.V. Webster, P.H. Bly, and Susan Pounds
Energy - Howard Simkowitz
Land Use - Howard Simkowitz, Christopher Kissling and Anthony May
Conclusions prepared by C. Kenneth Orski, General Rapporteur

(1) Pedestrians and Cyclists

Summary

Walking and cycling are intrinsically healthy, energy efficient, unobtrusive and non-polluting. They are also cheap and modest in their track requirements. Although the majority of urban dwellers are only prepared to walk a few hundred meters at a time, walking constitutes up to 40 per cent of all trips made daily in certain European cities. However, most journeys on foot to school or work seldom exceed one kilometre in length. Cyclists tend to travel longer distances. In northern Europe they average 2-4 kilometres while round trips of over 20 kms are not uncommon in the United States. Unlike the private car, however, perhaps 50 per cent of the bicycles owned in the United States are used only very infrequently, if at all.

Although topography and climate can strongly affect walking and cycling, the dangers and difficulty of using these modes are

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[5]Background Reports, Urban Transport and the Environment, Organization for Economic Eooperation and Development, Paris, July 1979.
[6]C. Kenneth Orski, "Conclusions of the Specialized Sessions" Conclusions, Urban Transport and The Environment, Organization for economic Cooperation and Development, Paris, July 1979.

also major determinants. The use of these soft modes must generally take place in mixed, multi-modal traffic streams and the unpleasant and dangerous nature of these conditions, particularly for the young and elderly, is a powerful deterrent. The challenge is to achieve a better fit between these more vulnerable modes and motorized ones so that they can either complement and extend the value of the latter in some circumstances or provide a safe and agreeable alternative in others.

This report describes actions to encourage walking and cycling ranging from completely segregated facilities to comprehensive traffic management schemes to road safety education programmes. The introduction of traffic cell systems in Swedish and Japanese cities such as Gothenburg and Nagoya has led to substantial reductions in car use (by 10 to 20 per cent) and brought about increases in cycling (from 15 to 30 per cent). Significant reductions in environmental nuisance and pedestrian and cyclist fatalities have also been registered. The report stresses the difficulties of protecting young children on foot, especially on trips to and from school, and points to the success of the "Green Cross Code" education programme introduced in the United Kingdom. This project aimed at teaching children to judge when it was safe to cross the road, brought about an 11 per cent reduction in accident rates and continued to produce beneficial if somewhat reduced effects following its termination. The main point to be noted here is the complementary role of physical and traffic planning and education in improving pedestrian and cyclist security.

Conclusions

It was particularly appropriate that this Seminar on Urban Transport and the Environment should open with a session on Pedestrians and Cyclists, for walking and cycling are at once the most energy conserving, least costly and environmentally sound forms of locomotion.

For many years, however, efforts to improve transportation on foot and bicycle were given scant attention. Cities seldom saw fit to cater to citizens' needs as pedestrians and cyclists with the same zeal as they responded to their needs as motorists. However, as the discussions at the first session of the Seminar have clearly demonstrated, these attitudes are changing. The old perception that only advanced technology can solve our urban mobility needs has given way to a new respect for the potential of walking and cycling as a practical and environmentally desirable way of moving in the city.

One of the greatest obstacles to the widespread use of bicycles in urban areas has been their vulnerability in mixed traffic. Ideally bicycles should be made to operate on separate rights of way. Unfortunately, separate bikeways are not always possible, or else can be built only at a considerable expense. Delegates believed that a more realistic policy might be to

proceed in small steps, extending bicycle paths incrementally as existing roads are rebuilt, and facilitating bicycle use in other simple ways.

In the area of pedestrian improvements, progress has been more impressive. What began in the mid-1960s as modest, tentative efforts to free main shopping streets from traffic in a few cities, has flowered in the late 1970s into widespread practice. Today, there is hardly a city or town in Europe that does not protect its historic centre from excessive automobile traffic. Some cities, such as Muncih and Essen, have done it by closing downtown streets to automobiles entirely; others such as Gothenburg and Groningen have chosen to restrict automobile access and divert through traffic with the help of traffic management techniques.

Delegates agreed that freeing urban spaces from traffic and rededicating them to pedestrians is not only popular with the public, but may be good for business. Whatever questions may still persist about traffic-free zones relate to the manner of their introduction rather than to their desirability.

The need to involve the public - especially residents and merchants - in pedestrian projects at an early stage was strongly emphasized at the Conference. Delegates felt that efforts should be made not simply to inform citizens after the key decisions have been made, but to allow affected persons an opportunity to influence decisions throughout the planning and implementation process.

(2) Traffic in Residential Areas

Summary

In most towns and cities over one-third of the built-up areas are used for housing and related activities and, on average, urban dwellers spend three-quarters of their lives in residential areas. The rise in motorization has often meant a considerable deterioration in the quality of life in these areas: accidents, pollution, noise nuisance, intrusion and disruption of local social interaction. The safety aspect is particularly important as these areas are the activity base of the very old and the very young. Research has made it clear that young children do not perceive roads and traffic as adults do and cannot be expected to behave like them. This suggests the need to adapt traffic in such areas to the capability of children. Although the scope for radical traffic management measures will usually be limited, modest improvements can be applied on a wide scale and bring about substantial improvements in the urban environment and quality of life in residential streets not functioning as main distributor routes.

This report discusses the various ways in which residential environments can be made safer and more agreeable by influencing the behavior of drivers and by judiciously allowing people, cars and goods vehicles to share the same space. Traffic regulations

and physical changes to roads may be used to manage the movement and parking of vehicles in residential areas. Perhaps the more interesting concept is the town yard or "woonerven" implemented in several Dutch towns. The main idea here is to create a street whose structure and appearance convinces drivers that they should behave differently from the way they do on other roads and in particular drive more slowly. The end result is a street where adults and children may walk, bicycle and play and engage in neighboring contact outside their homes in a wholesome environment and without being endangered or obstructed by vehicles.

Of course, traffic management measures that are unpopular will tend to be violated. As police enforcement is likely to be negligible in residential areas, self-enforcing techniques, wherever they are compatible with quick access by emergency services, should be employed. Automatically controlled rising and falling barriers are being used in two neighborhoods in Stockholm to prevent through traffic from using residential streets during the rush hours and at night. In Oxford, the installation of nine speed control bumps or "sleeping policemen", on 750 metres of road reduced daily vehicle flow by 41% and produced a decrease in average vehicle speed from 44 to 24 km/hr. Noise levels at building fronts were also reduced from 65 to 61.4 decibels. Ninety per cent of residents said they favored the bumps and 84% of drivers interviewed said they served a useful purpose. The main opposition to these and similar schemes has come from shopkeepers and other traders fearful of losing carborne clients. In view of the value of local shops to the eldery residents and the often marginal profitability of such outlets, any threat to them is of importance to residents.

Conclusions

As discussion at the second session of the Seminar revealed, a move is now underway to extend the concept of automobile management to residential neighborhoods. Limiting car traffic has come to be viewed not only as a way of stimulating commercial and economic activity in the centre of the city, but also as a means of creating a safe and more livable residential environment in existing inner city neighborhoods. Whereas in earlier days the choice was simply "to ban or not to ban," the Woonerf concept pioneered in the Netherlands has shown that there exists another option to integrate the automobile into the fabric of a neighborhood in a manner which is compatible with other residential functions: walking, biking, playing in the street and enjoying neighborly contact outside the home.

Delegates agreed that just as pedestrian streets proved to have a rejuvenating effect on downtown areas, so protected neighborhoods - whether in their original form of the Dutch Woonerf, their German variation of the wohnbereich, or in the form of residential parking permits as applied in the United States - may become a highly effective means of keeping cities livable and environmentally sound.

3(a) Para-transit: The European Experience

Summary

Paratransit modes such as shared taxis and mini-buses are often the dominant form of public transport in Third World cities. Even in Ankara, Turkey, taxis and "dolmus" operators still carry 13 per cent and 45 per cent of the daily trips compared to 15 per cent for the public buses. But in most OECD countries paratransit modes have played a negligible role in urban transport and up until recently were either considered marginal or ignored. As it became apparent that the economic and technical characteristics of conventional fixed-route, scheduled modes make them ill-suited to serve a wide range of demands in low density residential areas or cater properly to the needs of the carless, the young, the elderly and the handicapped, paratransit was accorded more serious consideration.

Basically, over the past decade, it has been recognized that there is a growing need to complement existing bus and urban rail systems, which cater to regular mass and largely uniform demands, by more flexible, user-oriented services which offer more convenient service to those who do not have access to private car use or who would like a more suitable public transport alternative. Paratransit can satisfy much of this need. It can serve as a feeder system to other public transport services, and provide for local or special duty transport tastes on demand. It can allow commuters to save money by ride-sharing in cars, vans and work buses. Demand responsive transportation, particularly for the disadvantaged, and commuter ride-sharing are increasingly advocated and employed in the United States by both the private and public sectors.

Paratransit development in most European Member countries has been less dynamic. There is apprehension about its possible impact on the patronage and financial status of established public transport services.

The ECMT report makes four major points: First of all, paratransit is not a short-lived phenomenon conjured up by a few technologists. It caters to concrete and doubtless enduring travel needs. Most paratransit modes are technically straightforward in principle, employing readily available vehicles and equipment. Apart from a series of over-elaborate dial-a-bus experiments, the failures which have occurred have been primarily due to inadequate planning, or site selection. These setbacks are only of slight importance when the overall situation is considered.

Secondly, paratransit must be regarded as complementary to conventional public transport, not as a competitor. Experience in European member countries over the last few year shows that the majority of all paratransit initiatives have been government sponsored, more especially by local authorities. Moreover, in the case of urban transport, apart from taxi

services, passenger transport undertakings in private ownership have practically disappeared, and it is also meaningless to speak of protection of public transport in urban areas since there is generally more than one public transport undertaking and each has different purposes and ranges of action.

Thirdly, paratransit by its very nature (scattered, few and rarely wealthy customers) has a largely "welfare" aspect. It is therefore usually difficult for paratransit systems, apart from the voluntary arrangements or car carpooling, to be financially viable, at least at the initial stage. But they could provide flexible and lease cost services. The costs of experiments and small scale systems of this type are very low in real terms when compared with the local authorities total budget from which they are financed and the aggregate appropriation for transport in their budget.

Finally, a primary role of central government in this field is to remove all legal or institutional obstacles which at national level might impede the introduction of new systems which might provide better transport. The coordination of paratransit with all other modes and the development of an appropriate institutional framework must be done at local level. This is an area where the United States and certain developing countries can provide important information and experience.

3(b) Paratransit in the United States

Summary

Interest in more flexible forms of urban public transportation began in the early 1970's in the United States when it was recognized that fixed route, fixed scheduled modes could not effectively or economically service all markets needing an alternative to the single occupant automobile. This is particularly true in low density areas, but even in high density sections, certain groups are better served by another mode. These alternative services were never considered a substitute for fixed route transit and they are not considered as such today. Rather, they supplement and complement the traditional system and not only increase the effectiveness of public transport but broaden the constituency who feel that they are benefitting from a publicly supported transport system.

Paratransit services include the multiple use of vehicle such as conventional taxis and car rental service but most of the attention in recent years has been on shared ride modes since these are the only ones eligible for Federal Government support. Although the original hopes that demand-responsive transportation systems, notably dial-a-ride, would become a rival to the private car (or at lease the second one) have been disproved by experience. Simpler systems using shared-taxis and minibuses work better and are especially useful for elderly and infirm travellers. Commuter ride-sharing, in the form of car, van and bus pools, is the most commonly used form of paratransit service.

Currently, about 15 million commuters ride-share to and from work in the United States. This represents 22% of those who commute to work by vehicle. Given expected trends in energy availability, air quality, urban development and the cost of transportation, ride-sharing will become increasingly important in the future. We are still in the learning stage. However, by estabishing effective programmes and placing ride-sharing on an equal footing with other modes, we will set the stage for a time when rider sharing may really be needed as an important element of urban transportation systems.

The sponsoring of ride-sharing and demand-responsive services by private companies, school and local transport authorities and health and welfare agencies requires coordination particularly at the local level to avoid duplication of effort and waste of resources. The need to direct and coordinate the whole system has led to the emergence of a paratransit development philosophy in the United States. This can best be described as a marketing approach to transport. That is, services are designed to meet the particular needs of market segments such as the elderly or commuters. The approach is flexible and responds to the needs of the potential user with the variations limited only by the imagination and ingenuity of the organizers. The philosophy of this marketing approach was best articulated by Dr. Frank Davis of the University of Tennessee under the title of Transportation Brokerage. He sees the broker as a planner and coordinator who performs the following functions: market research to identify transport needs, product development to design the required service, and service delivery using an existing or private transport providor. Thus, paratransit service can be tailored to meet the special needs of local communities or groups of travellers. It is flexible and in some cases more economical than conventional approaches and can bring private initiative and entrepreneurial spirit back into public transportation.

Conclusions

Conventional public transportation services, devised for conditions existing many years ago, cannot successfully cope with all of the travel needs of our changing cities. What is needed in addition to fixed route systems are flexible transportation services which could serve the dispersed travel patterns of our contemporary metropolitan areas in a more convenient and economic fashion. This need has given birth to a new concept of flexible public transportation known as "paratransit", discussed in the third session.

While originally paratransit was seen primarily as a means of providing high quality, door-to-door demand-responsive service in low density residential suburbs, high operating costs have proved to be a serious impediment to the widespread application of such services.

Today, paratransit is viewed as serving three other objectives:

1. Providing special transportation services to handicapped persons and others who are unable, or find it difficult, to use private cars. A number of OECD countries, including Sweden, Belgium, Germany, France, United Kingdom and the United States are actively pursuing programmes in this field. Despite its high operating cost, paratransit services are seen as a lower-cost alternative to making existing transportation vehicles and facilities fully accesible to handicapped users.

2. Providing public transportation services in low density rural areas where the patterns of travel are too dispersed to justify fixed route transportation.

3. Providing an alternative to the sole use of the private car for commuting purposes. Commuter ride-sharing has been receiving growing attention especially in North America because of its high potential to reduce automobile dependence and conserve petroleum.

Perhaps the greatest significance of paratransit in the view of the Seminar lies in its potential to bring about fundamental changes in the organization and management of public transportation. Since paratransit usually involves small-scale operations, it offers an opportunity to usher in a whole new set of independent service providers, including public taxi operators, and thus stimulate competition. Since paratransit is often offered as a bundle of differentiated services tailored to the needs of individual users, it encourages a market-oriented management approach to public transportation.

4(a) Regulations and Incentives

Summary

The urban transport sector is subject to various economic and technical regulations which affect competitive conditions and prices within markets, the quantity and quality of services offered safety and the quality of life and urban environment. The cost effectiveness of regulations is a highly controversial matter in certain Member countries. This controversy suggests the need for the assessment of the social, economic and environmental costs and benefits of new regulations and the periodic evaluation of regulations and alternatives with respect to achievement of policy objectives. The progressive reform or removal of economic regulations considered to be outdated, redundant or unnecessarily restrictive (particularly with regard to innovative mass and para-transit services) seems especially important at a time when urban transport must be provided in the context of a transition from cheap and abundant energy, high rates of economic growth and comparative price stability.

A more systematic use of economic instruments in urban areas could be effective in achieving a more rational use of private and public transport resources and an improved environment. New road user charges seemed called for - particularly in view of the fact that the owners and users of private vehicles rarely take full account of the costs they cause to others by imposing delays on their trips or reducing the safety and quality of their environment. There is also a general concern among Member countries to contain subsidization and obtain better value for money in terms of the service rendered to the public. This is particularly so with regard to the more selective allocation of subsidies to public transport operators or clearly defined user groups particularly in need of support rather than the general subsidies which are enjoyed by rich and poor alike.

Urban travel conditions could also be improved by providing users with improved information about the whole range of transport options available and by measures designed to spread peak travel demands. The transport brokerage concept pioneered in Knoxville, Tennessee seems particularly interesting as it stresses the potential role of local authorities as an intermediary in the assessment and provision of public transport and paratransit services tailored to local travel needs. The limited knowledge of the effects of more flexible working arrangements on urban travel behavior points to the need for better understanding of the overall transport and environmental effects of time-use planning throughout a community. Finally, neither traffic regulations nor economic restraint measures can offer a concrete solution. They can provide localized improvements in the short term but must be combined with traffic avoidance strategies based on land-use planning and transport infrastructure development to contribute to the achievement of longer-term objectives.

4(b) The Influence of Pricing on Travel Behavior and Modal Choice

Summary

Existing evidence confirms the belief that automobile travel in congested conditions is heavily subsidized. In peak periods and in heavily travelled areas (downtown) automobile users pay for neither the costs of delays imposed on other drivers nor the costs of noise, pollution and disruption borne by society as a whole. Society's subsidization of these costs is often significant and results in gross misallocation of society's resources. The consequences are heavy congestion, pollution, noise, disruption and reduced overall mobility.

The capacity of transit fare incentives alone to solve urban transportation problems should not be overestimated. Despite large increases in subsidies and the maintenance of low fare strategies, these transit fare incentives have not resulted in very significant shifts by auto users to transit. A 1% reduction in transit fares has only increased ridership by about 0.1 to 0.6% and only 0.02 to 0.15% of auto riders have shifted to

transit. Available evidence suggests that transit fare incentives have probably not substantially reduced congestion, except in areas where existing congestion was extremely severe. From a political standpoint, the fare incentive programmes have been easier to implement than programmes containing automobile use disincentives. However, decision-makers have been somewhat concerned about the increased local financial burdens implied by the need for larger subsidies.

Since most urban transport problems are thought to stem from excessive automobile use, measures designed to discourage automobile users are likely to be the most effective in solving these problems. In addition to their potential for solving many traffic related problems, price disincentives are likely to generate significant revenues, since car travel is inelastic over a large price range. These revenues could be used for financing transit expansion, compensating people most disturbed by motor vehicle use, or for other purposes such as relieving the general tax burden. The ultimate success of such programmes depends on whether these revenues are used to mitigate the possible adverse impacts of pricing disincentives. It is believed that the disincentives must be packaged with fare reductions and other transit incentives to be acceptable politically. Fare incentives should not be applied indiscriminately but should be tailored to the specific needs of localities, restricted to particular zones, routes, directions and target user groups.

General fiscal disincentives (fuel, registration and excise taxes) are essentially long-run strategies, which, in comparison with more specific disincentives that are time and location specific - have much more limited potential for affecting immediate improvements in urban transportation. Yet since they are also having a gradual impact on car ownership levels, the impact of these disincentives may increase over the long run.

Toll increases and parking surcharges have had a relatively small impact on modal shares and traffic - but may generate large revenues. In contrast, the road-pricing programme in Singapore has had great success in inducing people to shift from low-occupancy cars to carpools and public transport, and from peak to off-peak travel. Morning peak period traffic has been reduced by 45% (car traffic by 75%). In addition the programme has generated large revenues from the road user charges - but it is believed that the road usage prices now charged in Singapore might be much higher than the marginal costs of travel by auto, i.e. the government has set the charges higher than those originally recommended in order to increase the revenues produced by the scheme.

In most instances, the automobile price disincentives strategies proposed in London, Amsterdam etc. have encountered strong public and political opposition, resulting in governmental unwillingness to proceed with implementation. In essence road pricing is typically perceived as an untried approach with visible costs in the present and uncertain benefits in the

future. Future acceptance of road-pricing proposals (which will probably require careful nurturning of local constituencies over an extended time period) need to be better known and understood by citizens.

4(c) Pricing: Economic Measures for the Coordination of Private and Public Urban Transport

Summary

The main objectives of a coordinated fares and pricing policy are to switch commuter traffic from cars to public transport and to reduce the public transport deficit. The limited affect of fare reductions has been demonstrated in practical experiments in several European cities - even if no fare were charged at all only about 15% of car-users would change over to public transport. This is because motorists underestimate the cost of running a car and that there is too great a difference in quality of service between the car and public transport. It is only efficient underground and rapid transit railways systems that can be effective competition for the motor car. If lower fares are ineffective as a way of relieving the traffic situation in town centres, the policy should be directed more towards improving public transport economics.

There is virtually nowhere in Europe that public transport pays for itself. The escalating cost of running a car should help to make higher fares acceptable, but the structure of the fare should also be adapted to particular size of cities, etc. Another pricing instrument is compulsory contributions by means of a levy on those people who may derive certain benefits from the public transport system. It is unrelated to the extent of the actual use made of the service or to the degree of subjective utility. Compulsory contributions have already been successfully levied in Austria and France to finance public transport facilities - general urban transport tax, employee tax and employer (payroll tax), fiscal and para-fiscal charges on personal forms of transport. Such pricing policy may be concentrated on the car and employ the following measures - charges on acquisition and charges for owning and running a car.

In the case of cars the State can have only an indirect influence on the level and structure of transport costs: it can decide that part of them that consists of taxes and other charges. The result is a kind of pincer effect; a reduction of public transport fares can be backed up by higher taxation on car-use, so that a combined incentive-deterrent, push-pull system operates upon the traveller urging him in the direction of public transport.

Preconditions for selective taxation policy are (a) being able to differentiate between car transport inside and outside the conurbations and (b) the assurance that the tax increases

will make motorists alter their behavior in the desired direction.

Taxation that is selective in terms of time and place, however, stands little chance of achieving the desired effect. It is as a rule too expensive and not very practicable and it cannot be applied to through traffic. The only strategy left, therefore, is to make car use in general more expensive through specific car taxes. Experience in many countries, however, shows that even a drastic increase in the price of petrol - whether caused by fuel tax or not - has not brought about significant medium-term decline in car use.

Altogether it would appear that an effective diversion to public transport by this method would require such a drastic increase that its prohibitive nature could no longer be denied--which would rule it out for political reasons.

Car taxation strategies improve urban traffic conditions; not so much through their effects on modal split as through their financing effect, if the revenues raised goes to improve the infra-structure. For example roads could be taken out of town, local and regional budgets and covered by a special investment fund. Along with the money raised from motor transport to pay for the use of roads, contributions from the public budget to cover the non-transport functions of the streets should also flow into this fund, out of which resources for public transport could then also be drawn. This would be regarded as compensation for its provision and road relief functions and for other social costs specifically caused by cars.

Area licensing schemes, either for access to or presence in certain areas at certain times, could be combined to include the use of park-and-ride and/or public transport facilities. Even if the Singapore area licensing system may not be transposed to European cities of over a million inhabitants as it stands, it nevertheless proves that in every dense urban areas it is quite feasible politically and in practice to achieve an improvement in traffic conditions with a well designed licensing system.

Conclusions

For many years transportation policy concerned itself primarily with investment planning. With money in relative abundance, the question before transport decision-makers was not whether to build more facilities but where, when and how fast to build them. Today, with fiscal resources getting scarcer, attention is increasingly focused on how best to utilize the transportation investment already in place. The issue has shifted from how to meet growth in travel demand through provision of new facilities to how to accommodate this growth in demand through better management of existing facilities; from how to increase transportation <u>supply</u> to how to manage, influence, and at times restrain, transportation <u>demand</u>. This was the theme of the next two Seminar sessions.

There was a general concensus among delegates that both fiscal and regulatory measures have a place in a total strategy to influence transportation demand, i.e. modal choice and travel behavior. Regulations and pricing must be considered as complementary rather than mutually exclusive instruments.

There was also substantial agreement that lowering transit fares or keeping them artifically low through subsidies in unlikely, of itself, to induce a substantial shift from automobiles to public transport. High quality service was generally felt to be much more effective in attracting people to transit than low fares.

While a majority of delegates agreed that transport subsidies are necessary, the justification for these subsidies must be looked for in other policy objectives than that of winning over new riders and reducing automobile usage.

The greatest area of uncertainty surrounds the subject of automobile pricing disincentives known as "area licensing" or "road pricing". While one can point to Singapore as an example where automobile licensing has been highly successful in inducing commuters to shift from autos to carpools and transit, the introduction of area licensing schemes must be considered as a more general policy question involving wider social, economic and cultural issues.

Although pricing disincentives have proved controversial, the results of the Singapore experience have been dramatic enough to warrant serious consideration of its variants by other cities. The Singapore scheme has now been in place for four years and has demonstrated its practical feasibility as well as environmental benefits. The Seminar heard with interest that London had recently considered whether an area licensing scheme could be devised which would overcome the objectives encountered in an earlier proposal. Several other countries, notably Sweden and the United States, are actively investigating other forms of economic instruments such as parking surcharges and differential tolls to shift automobile drivers to public transportation.

5. Financing: Subsidization of Urban Public Transport

Summary

Until a decade or so ago subsidization of public transport operation was relatively uncommon, but since then, the practice has been growing in almost all western industrialized countries at such a rate that Governments have begun to question whether value for money is being obtained. In the last decade, subsidies have increased in most industrialized countries, not only in absolute terms, but also as a percentage of the total operating costs.

In spite of the general acceptance of subsidy, however, and perhaps because of the very large (and growing) amounts of money

involved, doubts about the wisdom of heavy subsidization, and the effect it has, are heard with increasing frequency. The questions which are being asked are:

- are subsidies giving good value for money?
- do we know what is wanted from subsidy?
- will subsidies go on increasing indefinitely?
- do subsidies lead to a lowering of efficiency and to important management?

The aims of subsidization are many and varied but generally are directed at either switching travellers from private to public transport or serving the needs of school children, the handicapped, old people, and those without a car available.

Subsidies in all the countries in this study have been growing over the years and are now at a level of between 10 and 70 per cent of operating costs. Costs of providing transport have also been increasing in all countries in line with average earnings, and at more than the rate of inflation. However, fares have risen in real terms (i.e., corrected for inflation) in only half of the countries and have been held steady in most of the others, while patronage has increased in some and decreased in others, with level of service (vehicle-kilometres operated travelled) tending to follow suit.

The step rise in subsidies which occurred in the early 1970's in many countries appears to have paralleled a steep rise in operating costs - a large proportion of which are composed of labor costs.

The ECMT survey shows that it would appear that provision of subsidy has had the intended effect of holding down fares and improving the quality of service available, and that each additional 1% of operating cost covered by subsidy instead of by fare tax revenue tends to increase patronage by about 0.2 per cent. When subsidy is increased to cover an extra 1% of operating cost, only about 0.4-0.5 per cent is funnelled into reduced fares and 0.0-0.3 into increased services. Thus of the 1% subsidy, between 0.2 and 0.6% is being used in ways which do not reduce fares or increase scheduled service levels - and it seems likely that a considerable percentage of this is accounted for by the 0.2 per cent rise in the labor cost which seems noncommitant with the provision of subsidy, and the 0.2-0.3 per cent rises in wages, which together increased unit costs by 0.4% to 0.6% and reduced productivity per employee by 0.15 to 0.3 per cent.

The report on financing shows the considerable range of financial support provided by government for public transport and the variety of objectives that this is intended to achieve. It emerges clearly from this report that public transport will be costly and will continue to require government financial support. However, it is clear that the most effective way this support can be used is in promoting a sufficient quantity of good quality service on the one hand while improving the productivity of the

public transport industry on the other. How these tasks can be accomplished is a topic meriting a major conference in its own right.

Conclusions

Concern was expressed about the rapid growth of transit deficits which some delegates felt might lead to decreased transit productivity. However, decisions about the proper level of subsidy to public transport should be considered in the global context of urban transportation financing. Some delegates believed that the full cost of automobile travel is not accounted for by the present system of pricing and taxation of road transport, and that comparisons based on actual costs might lead to a false conclusion that the automobile "pays it's own way", while public transport does not.

6. Energy

Summary

Between 15 and 33 per cent of the energy consumed in OECD countries is used for transport. The transport sector accounts for about 30 per cent of the petroleum consumed in European countries and about 50 per cent of the petroleum consumed in North America. Road transport accounts for about 80 per cent of the total with the portion devoted to the urban auto equal to 50 per cent in Europe and 60 per cent in North America. Thus the urban auto accounts for approximately 12 per cent of all petroleum consumed in Europe and 24 per cent in North America.

It has been estimated that a policy including both changes in the use of vehicles (changes in travel behavior) and changes to the vehicles themselves would result in an energy savings of 25 per cent in Europe and 50 per cent in the United States. The greater gain is possible in the United States where the average automobile currently consumes twice the amount of fuel per kilometer than its European counterpart. This savings translates into a potential 3 per cent reduction in total oil consumption in Europe and a 12 per cent reduction in the United States.

Several short-term measures exist that will reduce energy consumption by bringing about changes in the use of vehicles. These include fuel pricing, physical restraints, traffic management, reduced speed limits, preference for high occupancy vehicles, transit marketing, carpool programmes and education in energy saving measures. While many of these measures would bring about only small energy savings if implemented in isolation, collectively they would act in a mutually reinforcing manner and have a more important effect.

Within the next ten years major improvements in fuel efficiency can be expected in countries such as the United States and Canada, due to the replacement of predominantly heavy cars by

ones of lesser weight and engine power. However, in Western Europe and in Japan, where cars are already lighter and more fuel efficient, improvements in economy will be more difficult to achieve. Such improvements as are possible can be expected to lower the fuel consumption of European-sized cars to four litres per 100 km (60 mpg) but they will necessitate more costly engineering. Incentives to manufacturers to produce, and prospective purchasers to buy, such vehicles may therefore be necessary.

In the longer run new technologies will be needed, although decisions to develop them need be taken today in conditions of uncertainty. One unknown is that the production of new light weigh alloys may consume more energy than is saved by the resulting decreases in car weight. Further increases in fuel efficiency may also have to be traded off with lower levels of occupant protection, reduced capacity and performance and possible increases in environmental nuisances. The prospect of new engine technologies making a substantial impact on fuel efficiency during the 1980s is, however, remote, but twards the end of that decade other types of fuel may start to appear.

In addition to reducing dependence on outside energy sources, it is also possible for governments to prepare plans for maintaining mobility in the event of sudden shortfalls in the supply of fuel. Contingency plans of this kind are being prepared in Gothenburg at the request of the Swedish government. The Gothenburg plan, which calls for modifications to public transport, changes in work hours and carpooling is capable of dealing with decreases of up to fifty per cent in car availability. It involves the re-routing of public tranport services to areas that have the highest levels of car use where major shifts of mode are expected and the shortening of other transit routes to increase load factors. Hours of work for government employees, school children and industrial workers would be staggered in that order. Carpooling would be promoted by means of matching programmes and parking incentives.

The economic growth of the past thirty years and the expansion in car ownership associated with it have brought about an unparalled increase in mobility and the development of life-styles in which travel plays a key role. Some arguments may be heard that this super-mobility is self-defeating and some reaction against high-mobility and high-energy consuming life styles may be detected. However, on present evidence, life styles based on high levels of mobility seem likely to persist until and unless severe rises in fuel prices force them to be changed. What kind of action governments should take to change such life styles and so conserve fuel, and whether they should take action at all in advance of economic forces making it necessary, remain crucial issues for debate.

Conclusions

Transportation accounts for close to 25 per cent of all energy demand and 50 per cent of petroleum consumption in OECD countries. At the same time, transport is dependent on oil for 94 per cent of its energy demand. Given this high degree of dependency, and with future energy supplies uncertain, it behoves the transportation section to adopt two new objectives: 1) reduction of dependence on outside energy sources through conservation; and 2) prepare standby contingency plans for maintaining mobility in the event of sudden disruption in the supply of oil.

Given the dominant role of the automobile, the main thrust of the conservation efforts must focus on the automobile. Two generic sets of policies are available for reducing automative fuel consumption: the first set of policies would aim at increasing automative fuel efficiency through modifications in the design and performance of vehicles; the second set of policies would aim to conserve fuel through changes in the use of vehicles.

However, whatever interim relief technology may offer, delegates agreed that in the longer run it is not enough to "reinvent" the technology of the automobile, but that it is also necessary to re-think its use - not in a destructive manner of trying to banish the car from people's lives, but in a creative sense of seeking a new equilibrium between the desire for automobility and the need to reduce dependence on an uncertain supply of fuel.

7. Land Use

Summary

The interdependence of transport and land use has long been recognized. Access to activities depends upon the availability of transport while the type and distribution of activities determines transport networks and modes. Technological advances in transport have helped share the form and functional structure of cities--often in the absence of any coherent planning strategy.

Today there is growing concern over some of the effects of this land-use transportation interaction. Not only have transport systems covered large areas of land, but the kind of accessibility created by trucks and cars has encouraged activities to disperse and may have contributed to the decline of the population and the economy of some central areas.

While many effects of transport policies on land use are large scale and take time to emerge, small-scale, localized reductions in the extent of land devoted to transport, increases in access to activities and reductions in damage to the environment can be brought about in the short term.

Transport itself uses land and while some facilities such as major roads are used intensively, others, such as minor residential roads, are not and are often wastefully devoted to parking. In city centre shopping streets, pavements are likewise often used intensively by pedestrians while the roadway between them is congested by comparatively small numbers of shoppers driving around looking for somewhere to park.

The conversion of residential streets into landscaped yards or "woonerven" suitable for sitting and childrens' play and, in shopping centres, the creation of pedestrian malls can therefore result in a better use of transport space.

Residential areas typically account for 70 per cent of the land area of cities. It follows that any reduction in the land devoted to transport in them is likely to reduce overall urban land requirements to a measurable extent. Reductions may be sought by clustering houses around public transport services, reducing road design standards and laying out some roads as shared spaces for childrens' play and access by vehicles.

Land already used for transport may be used more intensively to avoid the need to take additional land. Various techniques including bus lanes, priorities for high-occupancy vehicles on urban freeways, and supplementary licensing, all of which encourage transit riding and car pooling, may be used to increase the people-moving capacity of existing transport land. In promoting transport changes of these kinds there is, however, always a possibility that access will be reduced. Where a shift from cars to transit is involved, the quality of the transit service plays a key role in shaping attitudes towards it and in deciding how much and by whom it is used.

The noise, vibration and air pollutants emitted by transport, plus the visual intrusion of transport structures and vehicles, all affect the users of adjoining land. Where new transport facilities are proposed, the putting of an obligation on developers of them to make environmental impact statements ensures that adverse side-effects are taken into account at the design stage and in any authorizations given by government.

Statutes such as the United Kingdom Land Compensation Act, which obliges promoters of transport projects to pay for the insulation of affected properties, puts even stronger pressure on designers to select solutions that optimize capital and compensation costs.

Transportation schemes, when properly designed, have positive effects on land use. Public authorities may accordingly seek to share in the financial proceeds of the accessibility they create by buying, controlling or taxing sites adjacent to stations or other points of access. Examples of the value created by pedestrian malls and underground railways being captured in this way can be found in Germany and the United States. The leasing of space above stations or transport rights-

of-way to bring about joint public and private development is another way for public transport authorities to capture some of the value of the accessibility they create. In some cases the proceeds of joint development can even be used to finance major transit improvements.

Development control and zoning powers are other tools with which government can seek to increase densities close to underground stations and so capitalize on the accessibility created by transport investment.

Conclusions

In the final analysis, however, harnessing the automobile is not going to solve the long-range problems of energy and the environment unless it is accompanied by a broader programme of orderly urban growth and land use planning. For more than 30 years now, thanks to the automobile, we have been making decisions on where to locate housing and activities with practically a total disregard of spatial constraints. The benefits from dispersed land use patterns have been undeniable, but these spatial arrangements not only work to the disadvantage of those who do not own or cannot use cars, but also run headlong into the problem of the growing scarcity of land and energy.

In existing urban areas where land use arrangements have been established, the patterns of movement and requirements for transportation in the short run are fixed. But in newly urbanized areas it is still possible to minimize travel requirements by deliberately planning settlements so that housing, employment and community services are physically closely integrated. Even established urban areas are in a constant state of change and can be made to redirect the process of growth and development in ways that will decrease the need for transportation.

These are long range strategies that will require careful planning, public discussion and probably new powers to intervene in the working of the private land market. However, if national imperatives to lessen dependence on uncertain oil supplies make reductions in automobile travel mandatory, then, the Seminar agreed, changes in land use patterns aimed at minimizing distances between homes, work and other centres of activity may, in the long run, prove to be the least painful and most desirable adjustments for society to make.

Appendix III

Summary of City Case Studies prepared by the OECD Secretariate[7]

	ANKARA pop. 1,690,000	BESANCON pop. 135,000	BRUSSELS pop. 1,029,000	CURITIBA pop. 950,000
OBJECTIVES	*Emphasis on effective land use planning to combat Ankara's history of uncontrolled growth and development. *Recognition that road capacity is limited, therefore need to improve public transport.	*To relieve congestion in and protect the environment of the historic city centre. *To provide a comprehensive experiment in traffic control and public transport improvement as an example for other French cities.	*To enable public transport to attract patronage with better services. *To promote access by the population to city-wide activities. *Reduction in travel time for journeys to and from work. *Reduce traffic problems adversely affecting the city economy.	*To provide guidelines for urban growth by integrated land use, traffic and mass transport. *To motivate the population to make the city its concern. *Avoidance of capital intensive additional road infrastructure. *Reclamation of urban space for pedestrian and cultural uses. *Discouragement of car use and promotion of public transport.
KEY POLICY ELEMENTS OF PLAN	*5,300 metres of segregated bus lanes. *0.1 sq. kms of shopping area pedestrianised from 10 a.m.-8 p.m. *Light Rapid Transit - first sections to open in 1981 integrated with bus and 'dolmus' (collective taxis). *Car parking tax to help pay for parking facilities for residents without garages.	*Restructured public transport - increased rolling stock - bus lanes - new routes - new fare policy - para transit for off peak. *Traffic Management - restricted access for certain vehicles - traffic cells - ring road - park and ride + central area parking restrictions - improved traffic control equipment. *Pedestrian zones.	*Decision to obtain immediate benefits from capital works by using trams in tunnels in pre-metro form. When sufficient underground sections finally joined end to end, the transition to metro operation would take place. Eventually, there are to be 5 lines, 70 km in length. *General policy to segregate public transport modes where they conflict with other traffic. *Decision to integrate all public transport systems through the use of general season tickets encouraging interchange, particularly between metro and railway. *A rapid tramway will complement the metro system. *Road infrastructure developments to concentrate on the ring motorway.	*Central core functions to expand along 2 development axes not in one central core. *Removal of through traffic by redirection and discontinuities. *High frequency bus services on development axes. *Special terminals and parking at interchange junctions. *Control of land use activity to match street capacity. *Released road space from narrow carriageway widths given to linear gardens, playgrounds. *Pedestrian promenades. *To seek quick action able later to be re-evaluated and adjusted.
GENERAL RESULTS	*Average bus speeds not as high as hoped as present low frequencies hinder boarding times. *Pedestrianisation successful and second zone is being prepared. *Need seen for two bus only streets in the centre. *Additional road capacity needed to ease congestion caused by bus lane reservations.	*Improved public transport Ridership up 75% in 2 years. *Bus service has become very frequent, fast and comfortable. *Through traffic has been eliminated markedly reducing central area congestion.	*19 tramway lines (153.4 km) with 51.2 km on segregated tracks. *11.7 km of metro operation - first operations commenced in September 1976. *28% of all public transport journeys use general season tickets. *Modal split of 66% rail to 33% road transport achieved. *27 bus routes (251.7 km) with 3.9 km in reserved lanes serves both metro and tramways. *Passengers on public transport continue to increase (+ 2.14% 1977-1978). *Car parking building at the end of metro is great success - plans for more.	*Circulation related to the development axes is successful as each uses 3 streets, the middle one for essential access parking and public transport, the 2 parallel outer streets for one-way traffic circulation. *Public transport patronage is rising rapidly encouraging the introduction of articulated buses.
SPECIFIC ENVIRONMENTAL ASPECTS	*More pleasant environments particularly for pedestrians.	*Less noise from private cars but more noise caused by buses, fewer accidents. *Attractively designed pedestrian areas have stimulated social and recreational life. *Shops have improved their facades and attractiveness of the city was increased.	*Surface vehicular traffic congestion has been reduced and traffic flow smoothed. *City centre revitalisation has been aided. *No major impact expected on air pollution and noise. Neither are considered to be problems by the authorities.	*Congestion has lessened. *Rise in "green" space per capita has been remarkable. In 1965 it was 0.5m^2 but by 1978 had risen to 12.0m^2 as a result of street reclamations. *Pedestrians enjoy a much improved central city environment and residential areas have more space for meeting in leisure activities.

[7]Overview, Urban Transport and the Environment, Organization for Economic Cooperation and Development, Paris, July 1979.

	GENEVA pop. 340,000	GOTHENBURG pop. 450,000	GRONINGEN pop. 160,000	LONDON pop. 7,100,000
OBJECTIVES	*To reduce the amount of car traffic. *To establish a preferential network for public transport. *To create public parking facilities while restricting building private car parks. *To convert designated spaces to pedestrian areas.	*To improve safety and the environment in the CBD. *To improve public transport. *To impose speedy and inexpensive solutions to traffic problems.	*To improve city centre environment reducing noise and air pollution. *To increase road safety by lessening conflict situations for weaker traffic elements.	*Slow the decline in population and employment through better environment and mobility by: - increased safety for pedestrians - improved bus operations - increased speed and reliability for road traffic, especially commercial traffic - reduced fuel consumption.
KEY POLICY ELEMENTS OF PLAN	*Outer ring road for through traffic. *Intermediate ring road to link suburbs. *Inner ring road (2 one-way loops centrally controlled signals) around town centre. *Traffic management to reduce car traffic in the city centre by: - parking restrictions - preferential treatment for bus - creation of pedestrian streets.	*First Phase: in city centre - traffic cells (5) with only public and emergency vehicles able to cross boundaries - reserved track space for trams - conversion of parking to short-term - ring road. *Second Phase: in central urban area 1976- - extension of cell system - cycle path improvements - parking policy expected to reduce traffic by 10% in central urban area by 1985.	*Elimination of through traffic from the inner city. *Better facilities for public transport and bicycles - central bus station for urban and regional network - special provision for cyclists wherever possible. *Pedestrian only streets. *Creation of 4 traffic cells.	*Imposition of traffic restraint mainly through parking control, target of a 33% reduction in 1974 levels of peak car traffic - controlled parking zones on-street - controls on the provision of new public car parks - controls on the operation of existing public car parks and use of temporary sites - controls on the provision of new private parking space.
GENERAL RESULTS	*Pedestrian flows up 10-15% in rue Basses district. *Reduction in inner city traffic up to 30-40% on the Ile bridges and Place Bel Air. *10% average increase in speed of public transport in peak hrs. *Steady increase in public transport ridership (73 million by 1978). *Development of publically controlled parking. *12 kms of cycle paths added to existing 21 kms network with further 6 kms projected.	*Improved public transport especially regularity. *Some reduction in tram operating costs. *Increase in car travel speeds in CBD and ring road. *Trade establishments boosted with no interest group adversely affected by the Plan. *Expected 7% increase in fuel costs after second phase cause longer journeys but flow conditions better.	*40% reduction in car traffic in the centre (80% in Grote Markt) but only a small modal shift. *10% increase in cyclists to the centre. *5% rise in visits to central shops. *5% rise in pedestrians passing the central cordon (15% on Saturdays) but less concentrated in time. *10% increase in cars parked in covered or multi-storied parks but no change in total city centre parking. *Some increased congestion on certain radial routes and ring road. *Faster bus movements in centre.	*Parking controls in themselves appear to have done little to achieve the objectives. *Average traffic speeds have increased a little. *Slight reduction in proportion of trips into Central London by car. *Need seen to extend parking control into the private non-residential sector and to complement parking controls with other means of traffic restraint such as area licensing, physical barriers and rerouting.
SPECIFIC ENVIRON-MENTAL ASPECTS	*Better road safety record 44% decrease 1970-75. *Less noise and air pollution CO down by 20-25% in centre. *Fringing neighbourhoods have experienced some negative impacts from diverted central city traffic. *Shopping environment much improved	*Improved safety, noise and air pollution. *Environmental gains for residents, workers, visitors - is major reason for the success of the scheme.	*Fall in central area noise levels by approx. 6dBA. *Few businesses or individuals wish to revert to previous conditions as the result is environmentally safer, pleasing and less congested.	*Less main road congestion. *Removal of clutter has improved safety.

	MADISON pop. 168,000	NAGOYA pop. 2,000,000	NOTTINGHAM pop. 305,000	OSAKA pop. 2,300,000
OBJECTIVES	*Create patterns of land use that will encourage the use of mass transit. *Recognition that public finance of buses is justifiable. *Maintain the vitality of the Central city. *Maintain the physical identity of neighbourhoods and protect them from through traffic. *Implement disincentives to low occupancy vehicle use.	*Short term measures to reduce congestion, improve bus services, reduce accidents, smog and noise. *Longer term extensions to the underground transit to relieve surface congestion as well as construction of 67 kms of ring road and radial overhead toll expressways.	*Statement that a new balance was to be struck that would provide increased benefits for bus passengers and pedestrians at the expense of motorists. *Traffic restraint measures in order to avoid the fiscal, environmental and social costs which would otherwise result from the continued pursuit of the long-term master highway plan.	*To decrease dependence on cars mainly by improving the quality and capacity of mass transport systems. *To introduce measures to protect the urban environment. *Place emphasis on Public Transport and pedestrian environments.
KEY FOLICY ELEMENTS OF PLAN	*Preferential treatment for transit and high occupancy vehicles (bus lanes and transit malls). *Bus route extensions so that 90% residents within 430 metres. *Provision of cyclist and pedestrian facilities. *Co-ordination through a single Metropolitan Transport Authority. *Rates which favour short-term parking. *Improved traffic flow by signals and one-way streets. *Extensive citizen participation and information dissemination. *Willingness to experiment with new management ideas backed by ordinance provisions.	*On-street parking ban in centre plus introduction of meters. *21 bus only lanes on approaches to river crossings. *Campaign to induce staggered travel times. *Area traffic control to divert longer distance movements. *Creation of 186 residential and school traffic cells with improved environments.	*Removal of through traffic from central core. *Free bus through city centre to serve new shopping development. *30% increase in bus services. *Traffic metered through "collars" on the radial routes. *Supplementary zone restraint. *Park and ride beyond outer zone served by express buses. *Creation of traffic cells and pedestrian precincts. *On-street parking restrictions and pricing restraints in public car parks (not private). *Linked traffic signals. *Truck bypass routes.	*Introduction of a "Ride and Ride System" (continuous terminal transfers between public transport modes) for 18 zones, and 25 transfer terminals each with attractive amenities. *Simple integrated fares. *Bus priority signals and lanes. *Computerised area traffic control. *Reduced CBD parking. *Improved pedestrian and cyclist facilities. *Better system information to users *Para transit "jumbo" taxis. *Consolidated goods deliveries from special centres.
GENERAL RESULTS	*Bus patronage up from 8 to 12.5 million 1971-1976. *Increased operating deficits on transit and increased road maintenance costs. *No call to construct freeways. *Transit share not increasing but significant impact on car traffic in the isthmus area. *Rise in popularity of bicycles but more accidents as a result. *Decline in downtown area appears to have been halted.	*16% reduction in cars entering CBD during morning peaks. *Modal shift from car to bus of 15%; car to train of 34% amongst 1,884 civil servants affected by parking restrictions. *3% increase in passengers on bus routes with bus only lanes. *Increase in traffic speeds from 20 to 24% on main roads with linked signal system.	*No significant change in travel patterns or modal split at peak hours. The zone and collar delays were too short to favour buses significantly. *Over 90% of car commuters from zones had free or subsidised city parking. *Central core scheme achieved its objectives with 50% reduction in circulating traffic, elimination of through traffic, better bus reliability. *Zone and collar system abandoned after 11 months. *Free shoppers' bus carried 120,000 passengers per week.	*Seven zones operational so far giving 10% passenger increase. *8% are new riders (of whom 30% ex cars) For 29% riders: less time and less transfers. For 34% riders: less time but more transfers. For 23% riders: more time - less than 2 mins. - less transfers. For 14% riders: more time (2 mins. +) but less transfers. For 0.1%: more time and more transfers.
SPECIFIC ENVIRON-MENTAL ASPECTS	*Continued traffic growth is making reduction of conflict situations more difficult. *Realisation that land use policies in the long term will be more effective in reducing energy consumption and protecting the urban environment of neighbourhoods than short term traffic management means.	*59% reduction in road deaths in central area. *57% reduction in road deaths in residential traffic cell areas. *16% reduction in car related pollutants. *12% reduction in trips involving the central ward.	*Reduction in accidents by 60%. *Improved physical appearance from attractive street paving and reduced congestion.	*Better pedestrian and cyclist facilities. *Beautification and creation of more open space. *Expected lower noise and air pollution but no measurements available as yet.

	OTTAWA pop. 528,000	PARIS pop. 2,200,000	OPORTO pop. 320,000	SINGAPORE pop. 2,200,000
OBJECTIVES	*The 1974 Regional Plan for Ottawa-Carleton identified 7 goals to direct transport improvement programmes of which 2 are environmental - one a general statement and the other dealing with neighbourhood intrusion.	*Promote public transport.	*To improve chaotic traffic, at low cost through adoption of techniques mostly found in North European cities. *To improve urban centre traffic. *To reduce regional disparities in transport services. *To improve general safety especially for pedestrians. *To improve the quality of life in the centre and along the old radial tramway routes.	*Incorporation of transport policy into a comprehensive urban strategy to conserve basic resources by: - restricting the ownership and use of private cars. - improving public transport services.
KEY POLICY ELEMENTS OF PLAN	*Parking charges (Can.$20-24 per month for federal government employees - the largest group). *Flexible work start/finish times 50% central employees. *Bus services doubled 1971-1976 and extended to poorly served residential areas. *Express busways (7 km) and other priority measures. *Diversion of through traffic from neighbourhoods. *Approval of new subdivisions only if meet transit requirements.	*A monthly transport pass that allows unlimited trips by public transport, effectively integrating the metro, express metro and SNCF train services. *A transport payroll tax (1.9% of salaries) paid by employers to help finance public transport. *Introduction of a network of reserved bus lanes to counter deterioration in operating conditions for buses - taxis also favoured as "high occupancy" vehicles. *Connection of express metro and SNCF train system (under construction).	*Creation of a ring road by improving the flow conditions on existing streets. *Central traffic management - 8 bus only lanes - 3 pedestrian zones of which 2 act as transit malls. *Central city approach roads improvements - bus only lanes - one-way streets with priority for transit - platooned access for buses to Don Luis bridge. Equal time splits on one lane for transit and private cars allows 180 buses per hour and 1,200 cars per hour to cross.	*Traffic restraint by: - supplementary cordon licensing in the morning peak period - parking charges sharply rising by length of stay in the centre - incentives for car pooling - park and ride alternatives - improved bus services - tax disincentives on car ownership.
GENERAL RESULTS	*Transit riders rose from 35.5 to 60.3 million 1971-1976 while car travel to CBD dropped. *Government employees using car for work trips dropped from 35 to 27%. *Significant accident reduction in residential neighbourhoods following diversion schemes. *Development of new suburban areas with better layout for transit. *Savings in avoidance of provision of extra road and parking capacity and in vehicle operating costs.	*"Carte Orange" fare system is highly successful with sales 1,150,000 in November 1976 and 1,350,000 in November 1978; 36% increase in bus use (5% on suburban buses). *Better bus regularity, though private cars regularly violate the bus lanes. *The transport payroll tax produced in 1977 close to 2.5 billion francs.	*Commercial traffic speeds increased up to 50%. *Delay reductions between 500 and 700 passenger hours per peak hour on most dense routes. *9% increase in traffic since 1975 *Improved pedestrian mobility and convenience in city centre. *Further extensions likely with user approval. *Parking remains the most critical transport management issue.	*An overall reduction of vehicles in the morning peak of 43% (70% for private cars). *Car poolers were 53% of all cars entering the restricted zone in the controlled period in Nov. '78. *Bus passengers increased with a significant modal shift by car owning households whose use of buses for work trips rose from 33% to 43%. *Patterns established following the introduction of the scheme have remained remarkably stable. *The rate of growth in car ownership has slowed.
SPECIFIC ENVIRONMENTAL ASPECTS	*A 15% reduction in peak period car use. *More mobility options and less dependence upon the car. *Carbon monoxide levels held constant at 13.15 ppm 1973-1975 compared average large North American cities of 23 ppm. *Population increase in inner city 1971-1976 suggests neighbourhood schemes are successful.	*There has been little direct impact on the physical environment as yet. The public transport image is however much improved and the promotion of public transport appears as a prerequisite for further efforts to restrain car traffic.	*Less congestion. *The traditional centre as a pedestrian meeting place is more congenial. *No quantification of noise and other pollution abatement but expected to be positive improvement.	*A reduction in the total volume of central area traffic has given greater freedom to pedestrians, improved appearance and safety, and a 30% reduction in air pollution in the morning peak compared to the rest of the day.

Explanatory notes

a) Traffic Cells

City centres or residential areas bounded by main roads may be divided into a series of cells. Entry and exit may be confined to a limited number of points on the boundary road. The effect is to prevent drivers from making through trips across cells and to oblige them to use the ring route thus shifting traffic from the interior to the periphery of the affected area. Pedestrian streets, bus priority measures, parking restrictions, one-way systems and other traffic management measures are often combined with traffic cells.

b) Zone and Collar Schemes

Cars used to drive from residential areas to places of work may be controlled by using traffic signals as "valves". Selected residential areas are treated as traffic cells (see above) and traffic signals used to regulate the flow of <u>departing</u> vehicles at all exits. These controlled areas are the zones. Traffic <u>entering</u> city centres and other areas attracting heavy flows of cars may likewise be regulated by traffic signals located on radial routes just before ring roads. These signals form collars. Traffic wish-

ing to avoid the controlled area may divert onto the ring route. Buses and other high occupancy vehicles wishing to enter the controlled area may be assisted to make unhindered entry by means of priority lanes and preferential signals. Low occupancy cars wishing to enter may, on the other hand, be held in queues at the "collars" for as long as necessary to ensure free flowing traffic conditions within the controlled area.

c) Pre-Metro Systems

Existing surface tram services may be given some of the characteristics of an underground railway by constructing short lengths of tunnel under particularly congested parts of the road network. Out in the suburbs interference from traffic may be eliminated by providing trams with segregated ways and building flyovers. Trams may be operated along lines with these characteristics until ridership reaches levels where conversion to higher performance rolling stock and signalling systems is justified.

d) Supplementary Licensing

In city centres or other places where traffic congestion is serious, vehicle movements may be diverted and reduced by obliging drivers entering the congested area to purchase and display a special, supplementary vehicle licence. The need to display such licences may be confined to peak travel times or to other periods. Licence-free passage may be given to buses and bicycles and to cars carrying more than a stipulated number of riders in order to promote higher occupancy rates and to avoid penalising lower income car owners. Enforcement may be limited to recording the registration numbers of vehicles not displaying licences at points of entry to the controlled area. But other solutions are also possible.

e) Car Pooling

A voluntary arrangement whereby two or more neighbours, colleagues at work or other companions regularly drive to and from a place of work, station, school, shopping centre or other common destination.

Appendix IV

Conclusions of the OECD Seminar on Urban Transport and the Environment[8]

David Bayliss
Chairman of the Seminar

Introduction

The welfare of our cities has become increasingly important as a public policy issue as their populations have grown. Of late there have been frequent indications of the economic, environmental and social degradation that can develop unless governments take corrective action at both the national and local level.

An increasingly discerning public demands that these problems be dealt with in a manner that includes close cooperation between citizens and decision-makers. While the public speaks with many voices and partisan interests often contradict each other, this process of debate is a healthy one. All sides should be considered and given proper weight in the decision-making process.

The general philosophy of urban policy development has become much more cautious about wholesale change; cautious because of uncertainty about the future and because of the too high incidence of failures of urban redevelopment programmes associated with the rapid economic growth of the 1950s and 1960s. Moreover, growing concern with environmental quality (air pollution, noise, neighborhood safety, conflicts in the use of land, etc.), energy scarcity and fiscal austerity point to policies of conservation, rehabilitation and more efficient use of existing facilities coupled with highly selective change and development.

Transport is but one of the contemporary urban problems albeit a major one, and this general philosophy applies here with particular force. Urban road transport is heavily dependent on the most vulnerable energy source - oil - and is likely to remain so in most countries for years to come. Recent events have provided us with the second of what is likely to become a series of reminders to conserve this resource. It is a key determinant of the quality of the urban environment and is especially sensitive to economic and social development.

Current Policy Directions

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[8]David Bayliss, "Conclusions of the Seminar, " Urban Transport and the Environemnt, Organization for Economic Cooperation and Development, Paris, July 1979.

In most cities, there is a clear need for significant intervention by government in the way the transport systems are used, involving either incentives or restrictions or both to encourage the use of more efficient means of transport. The degree and form of such intervention will, of course, be different for different areas as has been shown in the case studies. These differences will not just arise from the variation of transport and environmental circumstances among towns but also from public attitudes towards these and the willingness of governments to introduce the required measures. The common thread running through all these projects is the better use of resources, improvement of the environment, the need to maintain and improve accessibility and the optimization of what already exists rather than the construction of costly and often environmentally damaging new infrastructure.

From the case studies and background papers we have seen a range of measures to improve transport and the urban environment and a variety of ways in which these measures can be combined. Transport management schemes include at one extreme traffic management policies such as one-way streets, channelisation, linked traffic signals and improvements in public transport service quality. These are designed to prevent obvious inefficiency and excessive environmental impact. At the other extreme, there are the more far-reaching approaches such as Gothenburg's city-wide traffic cell system and parking programme and Singapore's area licensing scheme, both of which use economic instruments as a complement to other regulations. In these cities, public intervention has changed the relationship between demand and supply by the shaping and limitation of demand. Between the two is a spectrum of more or less progressive schemes making full use of conventional techniques and employing additional measures to limit traffic demand such as parking controls, bus priorities, car-free zones and parking/public transport pricing policies. It is clearly desirable that all the forms of urban transport be viewed by policy-makers as part of a unified whole and each treated consistently. Economic instruments appear efficient in achieving this. Some cities have attempted to identify the optimum limitation of vehicular traffic to contain congestion, to reduce its effects on the environment and public health. However, it would be difficult to agree on what this limit should be.

What is clear, however, is that more and more cities are finding that conventional traffic management can no longer cope with their traffic problems and therefore they are and will be trying progressive and more radical policies. Yet radical policies tend to attract opposition and can be very damaging if implemented without careful thought. Therefore decision-makers are understandably cautious about their introduction and well-conceived evaluations measuring the effects of the projects should be carried out.

Lessons Learned

Has the experience over the past few years anything to teach us in this respect?

Flexibility and Reversibility

We can see from most case studies that since the strategies adopted contain minimal high cost "irreversible" elements such as urban motorways, new metros, large-scale redevelopment, etc. the costs of "failure" are small. The Nottingham experiment has shown that removal of a radical scheme in a medium-sized city can be done fairly easily and that worthwhile elements can be retained. Similarly in other schemes, even where they have broadly achieved their objectives, they can often readily be modified and improved once the initial operating experience has been obtained. An example is the conversion of Singapore's shuttle buses to a more conventional service. We would be deluding ourselves, however, if we did not recognize that there can be costs of failure and, where there are risks, schemes must be designed to minimize the costs of total or partial reversion. The implementation of schemes should be carefully staged to ensure that the benefits sought are achieved as soon as possible.

Economic Instruments

Over the past few years interest has grown in the use of economic instruments to regulate road traffic. We have also seen several innovations in public transport fare systems such as period tickets which allow travel on all forms of public transport. Parking charge, off-peak concessions on public transport and subsidized travel vouchers for certain groups are well-known examples of this approach.

Now that area licensing is operating successfully in Singapore and is being studied by other cities, increasingly schemes of this kind should be included among the policy options for those places where the potential of established techniques is largely exploited.

Political Considerations

Apart from the physical and impact costs, the policital costs must be taken into account. No elected representative at local, regional or national level wants to be associated with an unsuccessful scheme, especially if it has become part of a political advocacy. Where schemes of this kind have been implemented successfully it has usually been a reflection more of careful planning and pragmatic implementation in the context of a political will to improve the urban environment and relieve congestion rather than a commitment to a particular scheme. If there is a lesson to be drawn from experience here, it is to keep the focus of political commitment on the objectives to be achieved rather than the exact means for their achievement and to

adopt a pragmatic and progressive programme of measures to this end.

Accessibility

Recent experience has shown us that real and substantial environmental and traffic benefits can be realized without undue restrictions on accessibility with carefully devised schemes. In certain situations accessibility can be increased. The Paris bus lane network and Ottawa's new suburbs are two cases in point. What is more, preference can be given to priority users so that interests of the community at large are better served. The accessibility requirements of the elderly, handicapped and others who have difficulty in travelling around our towns and cities must be given proper weight in the design and operation of urban transport.

Central Area Merchants

The introduction of progressive transport management schemes has confirmed the robustness of city centres and their ability to cope with and thrive on well-conceived change. This lesson is particularly important as the success and well-being of central areas is of concern to several sectors of the community including local politicians and central area merchants. Often the spectre of lost trade has been raised as a major objection to traffic management, even though the history of such schemes has shown these fears to be ill founded, and in some cases, transport has contributed positively to the revitalization of the urban core. However, the strong support of the business community is often a deciding factor in bringing about traffic management experiments and having them made permanent. Thus, these persons should be encouraged to participate actively in the planning process.

Role of Governments

A harmony of interests and coordination between all levels of government involved is important if schemes of the kind described are to be effective. National governments must do their best to provide local government agencies with the elbow room and power to take their own initiative.

Complementarity of Measures

Successful management schemes must comprise a careful blend of complementary measures related to the circumstances and aspirations of each individual area. They must contain measures that encourage the use of public transport and secure environmental benefits as well as regulating and influencing the use of private vehicles. Since the relative merits among transport modes depend upon trip purpose and city form, what is sought is the proper balance among modes that enables all segments of the population to satisfy effectively their travel needs. Non-transport measures such as changes to land use and

activity patterns (e.g. flexible working hours) must also be considered.

Participatory Process

The process for the identification of objectives, scheme design and evaluation should involve the participation of the principal interest groups likely to be affected and, as appropriate, the public at large.

Effect of Urban Characteristics

It must be recognized that the size, complexity and design of the urban area is of major importance in itself. In medium-sized cites with a clear and dominant central area, it is possible to introduce a package of transport management arrangements which can produce rapid and dramatic change, especially when the existing level of management is low. In larger cities, rapid and dramatic change is likely to be local with wide-ranging measures being introduced more gradually and with less obvious impact in the short term.

Final Remarks

Finally, it is necessary to remember that our main concern is the quality of life and the need to view urban transport in this context. We have seen how important a properly designed and functioning transport system is to the environmental, economic and social aspects of urban life. The use of low-cost management changes and economic instruments can enhance these qualities by encouraging changes which fit in with a more general desire to protect our urban heritage, conserve scarce resources and improve the economy. Much still remains to be done, and success in these matters needs a bold and innovative approach; it requires careful planning and consultation; it requires good relationships among public officials; it requires a willingness to experiment and perhaps suffer temporary setbacks; but most of all it requires a determination to break the pattern of increasing congestion and pollution of our cities and to re-establish the motor vehicle as man's able and willing servant for a better urban life.

APPENDIX V

U.S. Delegation
to
OECD Seminar on "Urban Transport and the Environment"

Hon. Mortimer L. Downey
Assistant Secretary of Transportation for Budget and Programs
and Head of U.S. Delegation
U.S. Department of Transportation

Mr. Alan Beals
Executive Director
National League of Cities

Mr. Lawrence Dahms
Commissioner
Metropolitan Transportation Commission

Mr. Thomas Downs
Associate Administrator for Planning
Federal Highway Administration

Dr. John Dyer
County Administrator
Metropolitan/Dade County Transit Authority

Mr. Ron Fisher
Director
Office of Service and Methods Demonstration
Urban Mass Transportation Administration

Hon. Neil Goldschmidt
Mayor of Portland, Oregon

Calvin Grayson
Secretary of Transportation
State of Kentucky

Hon. Margaret T. Hance
Mayor of Phoenix, Arizona

Ernest Morial
Mayor of New Orleans, Louisiana

David Hawkins
Assistant Administrator for Air and Waste Management
Environmental Protection Agency

Mr. Ted Lutz
General Manager
Washington Metropolitan Area Transit Authority

Mrs. Jessie M. Rattley
Council Member, Newport News, Virginia

Cathy Reynolds
Council Member, Denver, Colorado

Mr. Larry Salci
General Manager
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Mr. B.R. Stokes
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